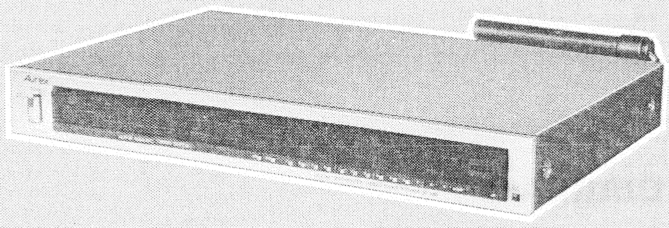
SERVICE DATA
FILE NO.170-139

TOSHIBA

DIGITAL SYNTHESIZER TUNER

ST-S80



SPECIFICATIONS

■ General Data

Power supply:	220V – 50 Hz for Europe 240V – 50 Hz for United Kingdom
Power consumption:	15W
System dimensions:	420(W) x 73(H) x 286.5(D) mm
System weight:	2.9kg

■ Tuner

Micro computer controlled frequency synthesizer tuning.

Frequency range:	FM	87.50 – 108.00 MHz 411 channels
	AM	522 – 1602 kHz 121 channels
Memory:	30 channels total	
Functions:	Manual scanning (FM 50 kHz step, AM 9 kHz step)	

■ FM Tuner Section

Sensitivity (IHF):	1.9μV (10.8 dBf)
Harmonic distortion:	1 kHz MONO 0.15% STEREO 0.25%
S/N:	MONO 74 dB STEREO 69 dB
Frequency response:	30 – 15 kHz ± 1.0 dB
Selectivity (IHF):	75 dB (±300 kHz)
Image rejection:	85 dB
IF rejection:	100 dB
Capture ratio:	1.0 dB
Spurious response:	103 dB
AM suppression:	68 dB
Stereo separation:	45 dB (at 1 kHz)

■ AM Tuner Section

Receiving frequency:	522 – 1602 kHz (9 kHz step)
Sensitivity:	300μV/m
Selectivity:	30 dB
Image rejection:	50 dB
S/N:	55 dB

Specifications are subject to change without notice.

TE, TU

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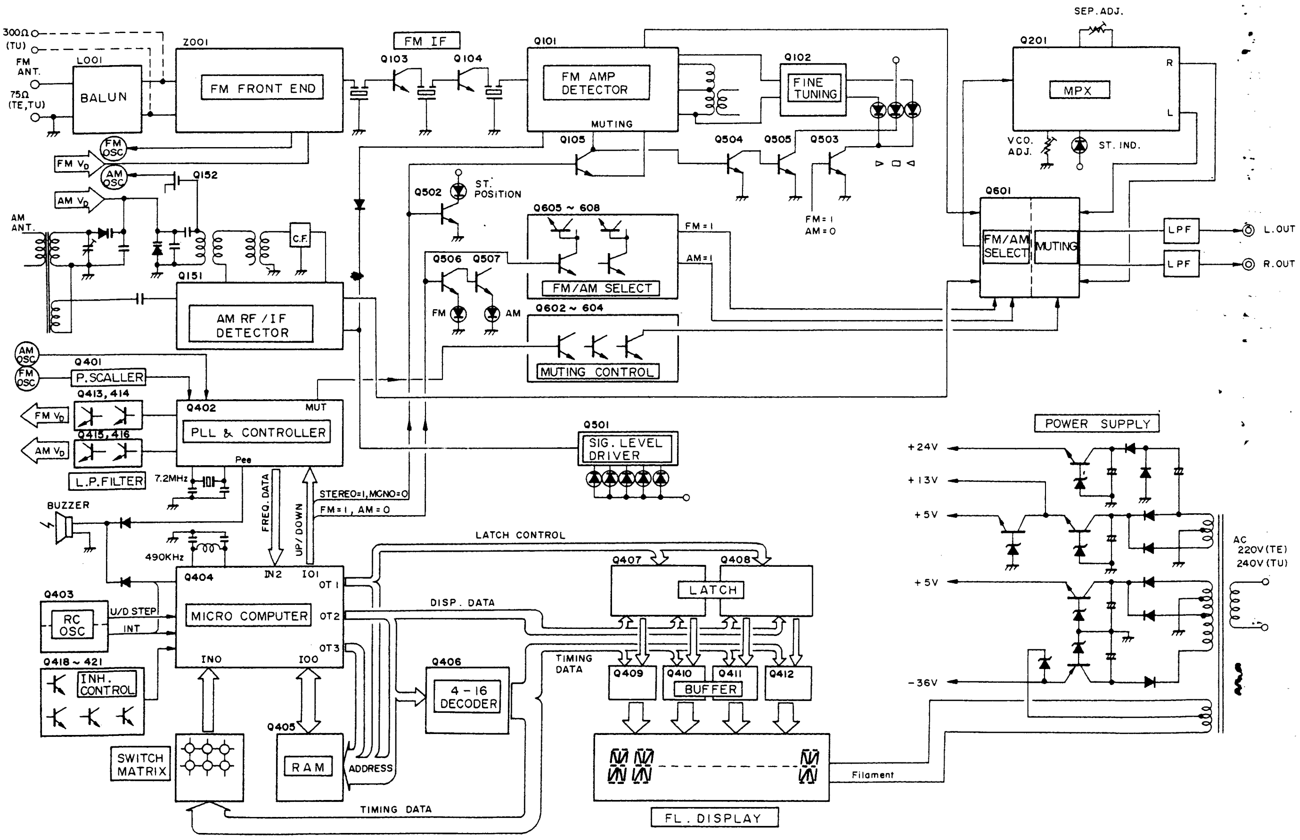
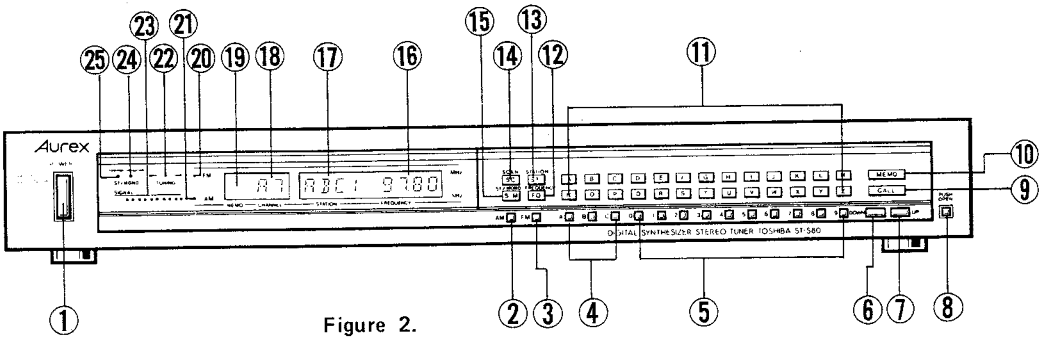
1. BLOCK DIAGRAM



300Ω (TU)
FM ANT.
75Ω (TE,TU)
L001
BALUN
Z001
FM FRONT END
FM IF
Q103
Q104
Q101
FM AMP DETECTOR
MUTING
Q102
FINE TUNING
SEP. ADJ.
Q201
MPX
R
L
VCO. ADJ.
ST. IND.
FM OSC
FM V_D
AM OSC
AM V_D
Q152
AM ANT.
C.F.
Q151
AM RF / IF DETECTOR
Q105
Q502
ST. POSITION
Q605 ~ 608
FM/AM SELECT
FM=1
AM=1
Q506
Q507
FM
AM
Q602 ~ 604
MUTING CONTROL
Q504
Q505
Q503
FM=1
AM=0
Q601
FM/AM SELECT
MUTING
LPF
L. OUT
R. OUT
Q401
P. SCALLER
Q413, 414
Q415, 416
L.P. FILTER
7.2MHz
Q402
MUT
PLL & CONTROLLER
Pee
FREQ. DATA
UP/DOWN
STEREO=1, MONO=0
FM=1, AM=0
Q501
SIG. LEVEL DRIVER
POWER SUPPLY
+24V
+13V
+5V
+5V
-36V
AC 220V (TE) 240V (TU)
BUZZER
490KHz
Q404
IN2
IO1
OT1
OT2
OT3
INO
IOO
MICRO COMPUTER
Q403
RC OSC
U/D STEP
INT
Q418 ~ 421
INH. CONTROL
LATCH CONTROL
DISP. DATA
Q407
Q408
LATCH
TIMING DATA
Q409
Q410
Q411
Q412
BUFFER
Q406
4 - 16 DECODER
Q405
RAM
ADDRESS
SWITCH MATRIX
TIMING DATA
Filament
FL. DISPLAY

Figure 1.

2. OPERATING CONTROLS


①
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⑱
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⑳
㉑
㉒
㉓
㉔
㉕
Aurex
MEMO
CALL
DIGITAL SYNTHESIZER STEREO TUNER TOSHIBA ST-S80

Figure 2.

System Connections

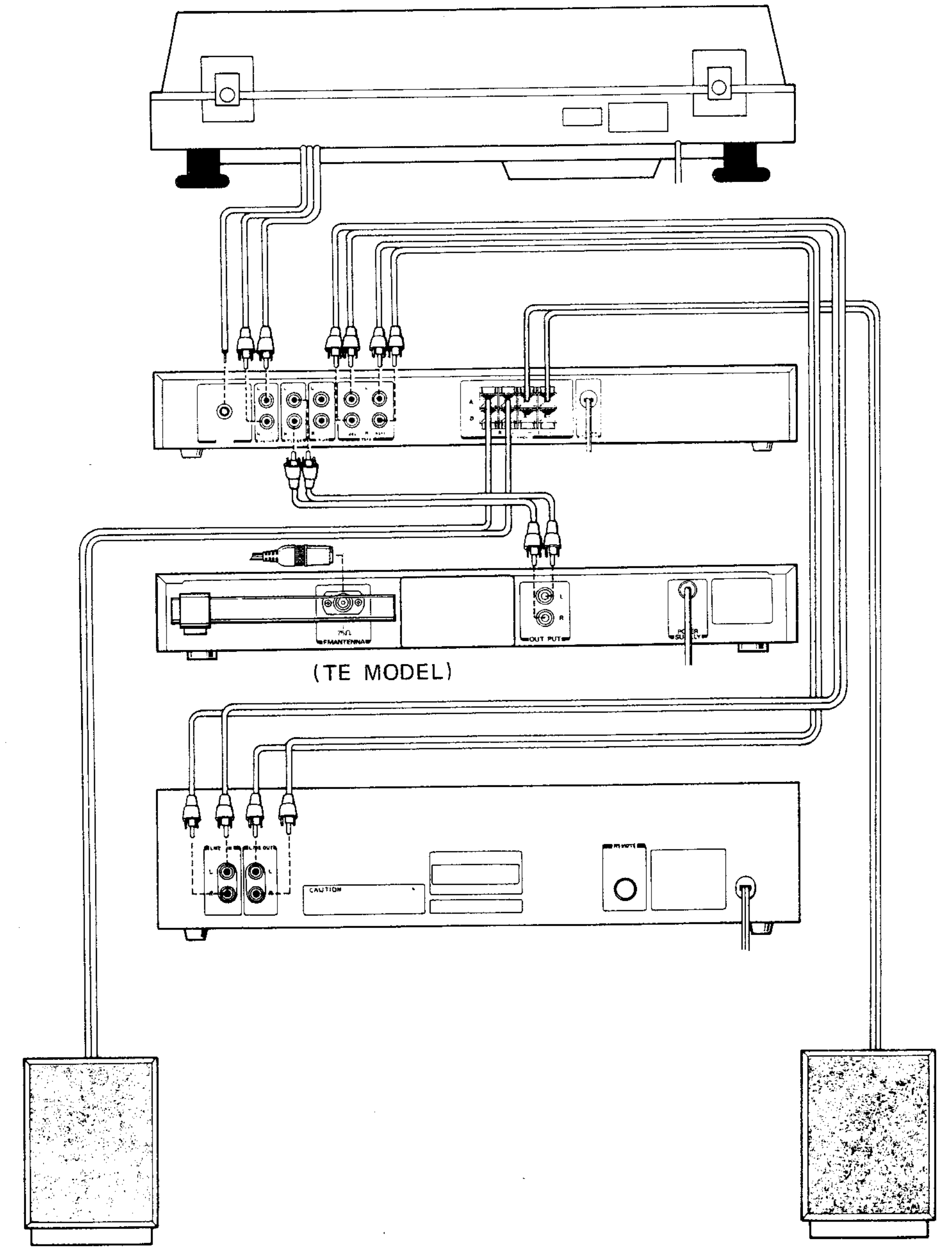

75Ω
FM ANTENNA
L
R
OUT PUT
(TE MODEL)
CAUTION

Figure 3.

Fig. 1

Front Panel Facilities

① **Function switch**
Depress this switch to turn the power on. Depress again to put tuner into stand-by mode.

Radio band selector buttons

Choose programme source by pressing one of these buttons:
② for AM radio broadcasts
③ for FM radio broadcasts

Preset tuning buttons

④ **Channel selector buttons**
These buttons are used together with numeric input buttons ⑤ to tune or to store up to 30 desired station frequencies in the ST-S80 memory. Press one of these buttons ④ to select the desired preset channel (group of 10 preset positions):

A:	preset stations 0 – 9
B:	preset stations 0 – 9
C:	preset stations 0 – 9

⑤ **Numeric input buttons**
Depress these buttons, along with appropriate channel selector button ④ to store desired stations in the ST-S80 memory or for instant tuning of these stations once they are stored. These buttons are also used for readout of a preset station's code or frequency and for storing these data in the memory.

Manual tuning buttons

⑥ **Down**
When the "down" tuning button is pressed, the tuned frequency is decreased in 50 kHz steps for the FM band and 9 kHz steps for AM. This stepwise change in frequency continues until the button is released.

⑦ **Up**
Similarly, when the "up" tuning button is pressed, the tuned frequency is increased in 50 kHz steps for the FM band and 9 kHz for AM until the button is released.

⑧ **Cover panel opening button**
Depress this button to open the cover panel.

⑨ **Station/frequency call button**
Depress this button to tune desired preset station code or frequency.

⑩ **Memory button**
Depress this button to store desired station code or frequency in the ST-S80 memory.

⑪ **Alphabetical input buttons**
Depress these buttons to store desired station's code in the memory or to tune preset station by its code.

Command selector buttons

⑫ **Frequency button**
Depress this button to tune station by frequency or to store desired station frequency in the ST-S80 memory.

⑬ **Station button**
Depress this button to tune preset station by code or to store desired station code in the ST-S80 memory.

⑭ **Scan button**
Depress this button to review preset station codes and frequencies stored in the memory. An automatic scan of preset stations begins when button is pressed and pauses at each preset station for about 4 seconds.

⑮ **Mode selector button**
Depress this button for mono mode. Return it to normal position for stereo mode.

Indicators

⑯ **Digital frequency indicator**
The tuned frequency, either FM or AM, is displayed here in digital form.

⑰ **Station indicator**
The tuned station's code, either FM or AM, is displayed here alphabetically.

⑱ **Preset station indicator**
The tuned preset station (preset stations 0 to 9 on each preset channel A, B and C) is indicated here by its preset number.

⑲ **Memory indicator**
This indicator shows the lighted letter 'M' when memory button ⑩ is depressed.

⑳ **FM band indicator**
This LED indicator is lighted whenever the FM band is being received.

㉑ **AM band indicator**
This LED indicator is lighted whenever the AM band is being received.

㉒ **Fine tuning indicator (FM)**
One of a pair of triangular red LEDs is lighted to show proper direction for further tuning (up or down). When the station is optimally tuned, the green LED between the triangular red LEDs lights up, and neither red LED remains lighted.

㉓ **Signal level indicator**
These LEDs light up successively from left to right according to the strength of the signal being received. If fewer than four pairs of LED light up when a local station is tuned, check aerial connections and direction.

㉔ **FM stereo indicator lamp**
This lamp is lighted whenever an FM stereo broadcast is being received.

㉕ **Mode indicator lamp**
This lamp is lighted when mode selector button ⑭ is set in STEREO position.

Connections

Refer to figure 1.

(1) Terminals are provided for 75 ohm FM aerial only. For 300 ohm FM aerial, use matching adaptor.
(2) When listening to AM band, adjust bar aerial to optimum direction for good reception.
(3) Connect output terminals of tuner to the tuner input terminals of your amplifier, making sure that L and R cables are not reversed.

Tuner Operation

In the following description of tuner operation an FM station, ABC1 at 97.80 MHz, is taken as an example.

■ To tune stations

• Preset tuning

There are four ways to tune stations stored in the ST-S80 memory, as follows. (For stations not stored in the memory, refer first to "Manual Tuning" and "To Store Station in the Memory".)

Tuning Method	Operation	Display	Notes
By station code	Depress buttons in this order: [ST] [A] [B] [C] [1] [CALL] .	[A7] [ABC1 97.80]	* When tuning a station that is not stored in the memory, (depressing [ST] [B] [B] [C] [1] [CALL] , for example) asterisks appear on the display instead of station code. In this case, the display returns to its previous reading about one second later.
By station frequency	❶ Depress FM band selector ③. ❷ Depress buttons in this order: [FQ] [9] [7] [8] [CALL]	[A7] [ABC1 97.80]	* When the station code of the tuned frequency is already stored in the memory, it will also be shown on the display. * When a station that is not stored in the memory is tuned, the tuned frequency is shown on the display. (e.g.) Depressing [FQ] [9] [7] [9] [CALL] results in this display: [ ] [97.90]
By preset tuning buttons (When station 'ABC1' is already stored in preset frame A7.)	Depress buttons in this order: [A] [7]	[A7] [ABC1 97.80]	* When tuning a station that is not stored in the memory, a fixed frequency of 87.50 MHz is tuned and is shown on the display. (e.g.) Depressing [A] [8] results in this display: [A8] [87.50]. * In tuning by this method, first press one of the channel selector buttons ④, and then press the numeric input buttons [0] – [9] . No station can be tuned by pressing the numeric input buttons only.
By memory channel scan	❶ Tune a station where memory channel scan starts. ❷ Depress the [SC] button.	The memory channel scan starts from the tuned station, pausing at each station about four seconds.	* Memory channel scan stops when the [SC] button is pressed again. * Memory channel scan stops when preset tuning buttons are pressed, and the station stored in that preset frame is received. * For preset frames where no station is stored, a fixed frequency of 87.50 MHz is received and displayed.

• Manual tuning —— to tune a desired station manually by searching up or down the frequency range.

Operation	Display	Notes
❶ Depress one of the band selector buttons, AM ② or FM ③. ❷ Depress UP ⑦ or DOWN ⑥ manual tuning button until desired station frequency is reached.	[ ] [96.50] [A7] [ABC1 97.80]	* Pressing the [UP] or [DOWN] manual tuning button once changes frequency in stepwise manner, by 0.05 MHz each time in FM and by 9 kHz in AM. When the button is continuously depressed, stepwise frequency changes continue until the button is released. * When tuning stops at a frequency already preset in the memory, the stored data for that station are automatically shown on the display.

■ To store stations in memory

The ST-S80 memory can store up to 30 stations —— 10 each on A, B and C preset channels. Since this is of a random memory, stations can be stored in the 30 preset frames in any desired sequence. It is not necessary, for example, to place the first station stored in preset frame A0.

Tuning Method	Operation	Display	Notes
To store both station code and frequency (In the case of storing station 'ABC1' at 97.8 MHz in preset frame A7.)	❶ Depress manual tuning button [UP] / [DOWN] or depress buttons in this order: [FQ] [9] [7] [8]. ❷ Depress buttons in this order: [ST] [A] [B] [C] [1] [MEMO] [A] [7]	❶ [ ] [97.80] ❷ [A7] [ABC1 97.80]	* Be sure to carry out operation ❶ first, to display the frequency, and then carry out operation ❷. * For correction, first press [FQ] button and then repeat this procedure from the beginning.
To store station frequency (In the case of storing a station at 97.8 MHz in preset frame A7.)	❶ Depress manual tuning button [UP] / [DOWN] or depress buttons in this order: [FQ] [9] [7] [8] . ❷ Depress buttons in this order: [MEMO] [A] [7]	❶ [ ] [97.80] ❷ [A7] [97.80]	* Be sure to carry out operation ❶ first, to display the frequency, and then carry out operation ❷. * For correction, first press [FQ] button and then repeat this procedure from the beginning.
To add station code to a stored station frequency (To add station code 'ABC1' to frequency of 97.80 MHz stored in preset frame A7.)	❶ Depress buttons in this order: [A] [7] ❷ Depress buttons in this order: [ST] [A] [B] [C] [1] [MEMO] [A] [7]	❶ [A7] [97.80] ❷ [A7] [ABC1 97.80]	* Be sure to carry out operation ❶ first, to display the frequency, and then carry out operation ❷. * Be sure to carry out the operation completely. Do not forget to specify the preset frame.

Note:

- When a station being tuned by preset tuning is at a considerable frequency distance from the previously tuned station – for example, when tuning a station at 531 kHz from 1530 kHz – a few seconds may be required to tune a new station.
- When a station code or a station frequency is put into the memory, the reception mode setting at that time (stereo or mono) is also stored at the same time. When that stored station is tuned later, it is received with the preset reception mode, irrespective of previous reception mode setting.
- To correct a part of an entry in the memory, such as station code, station frequency or preset frame, repeat all memory procedures from the beginning. After this step is completed, the previous entry is erased from the memory. (Thus it is not possible to store two different stations in the same preset frame.) For example, to change the frequency of station ABC1 from 97.8 MHz to 98.0 MHz in the memory, depress buttons in this order:
  [FQ] [9] [8] [0] [ST] [A] [B] [C] [1] [MEMO] [A] [7] .
- AM station frequencies are assigned in multiples of nine. Thus when a station frequency other than a multiple of nine is put into the memory, it is automatically corrected to the frequency that is a multiple of nine and is then stored in the memory. For example, if buttons are depressed in the order:
  [FQ] [5] [5] [2] [MEMO] [8] [8] , then the frequency actually stored in preset frame B8 is:
  (1) 558 kHz (the next multiple of nine higher than the incorrectly input 552 kHz) if the previously displayed station frequency was lower than 552 kHz —— for example, 540 kHz.
  (2) 549 kHz (the next multiple of nine lower than the incorrectly input 552 kHz) if the previously displayed station frequency was higher than 552 kHz —— for example, 648 kHz.

• Station Code

(1) A station code of up to four characters can be stored.

(2) Letters and numerals can be used in any desired combination.

For example:

* Depress buttons in the order [ST] [A] [B] .
Display shows: [ ] [AB]

* Depress buttons in the order [ST] [X] [Y] [9] [0] .
Display shows: [ ] [XY90]

* Depress buttons in the order [ST] [A] [B] [C] [1] .
Display shows: [ ] [ABC1]

* Depress buttons in the order [ST] [1] [2] [3] [4] .
Display shows: [ ] [1234]

• To Store a Station Frequency by Numeric Input Buttons

(1) To store an FM station frequency lower than 100 MHz:
When three of the four digits expressing the frequency have been input (e.g. 97.8), the numeral '0' is automatically added as the fourth digit (97.8 → 97.80) and appears in the display. Depressing the '5' numeric input button changes the fourth digit of the input frequency from '0' to '5'. Otherwise, '0' remains the fourth digit in the stored frequency. (The ST-S80 memory accepts only '0' or '5' as the last digit in a station frequency.)

Example:
Depress buttons in the order [FQ] [9] [7] [8] . Display shows: [ ] [97.80]

Now depress button [5] . Display shows:
[ ] [97.85]

(2) To store an FM station frequency higher than 100 MHz:
When four of the five digits expressing the frequency have been input, the numeral '0' is automatically added as the fifth digit and appears in the display. Depressing the '5' numeric input button changes the fifth digit of the input frequency from '0' to '5'. Otherwise, '0' remains the fifth digit in the stored frequency. (As noted above, the ST-S80 memory accepts only '0' or '5' as the last digit in a station frequency.)

Example:
Depress buttons in the order [FQ] [1] [0] [2] [1]
Display shows: [ ] [102.10]
Now depress button [5] .
Display shows: [ ] [102.15]

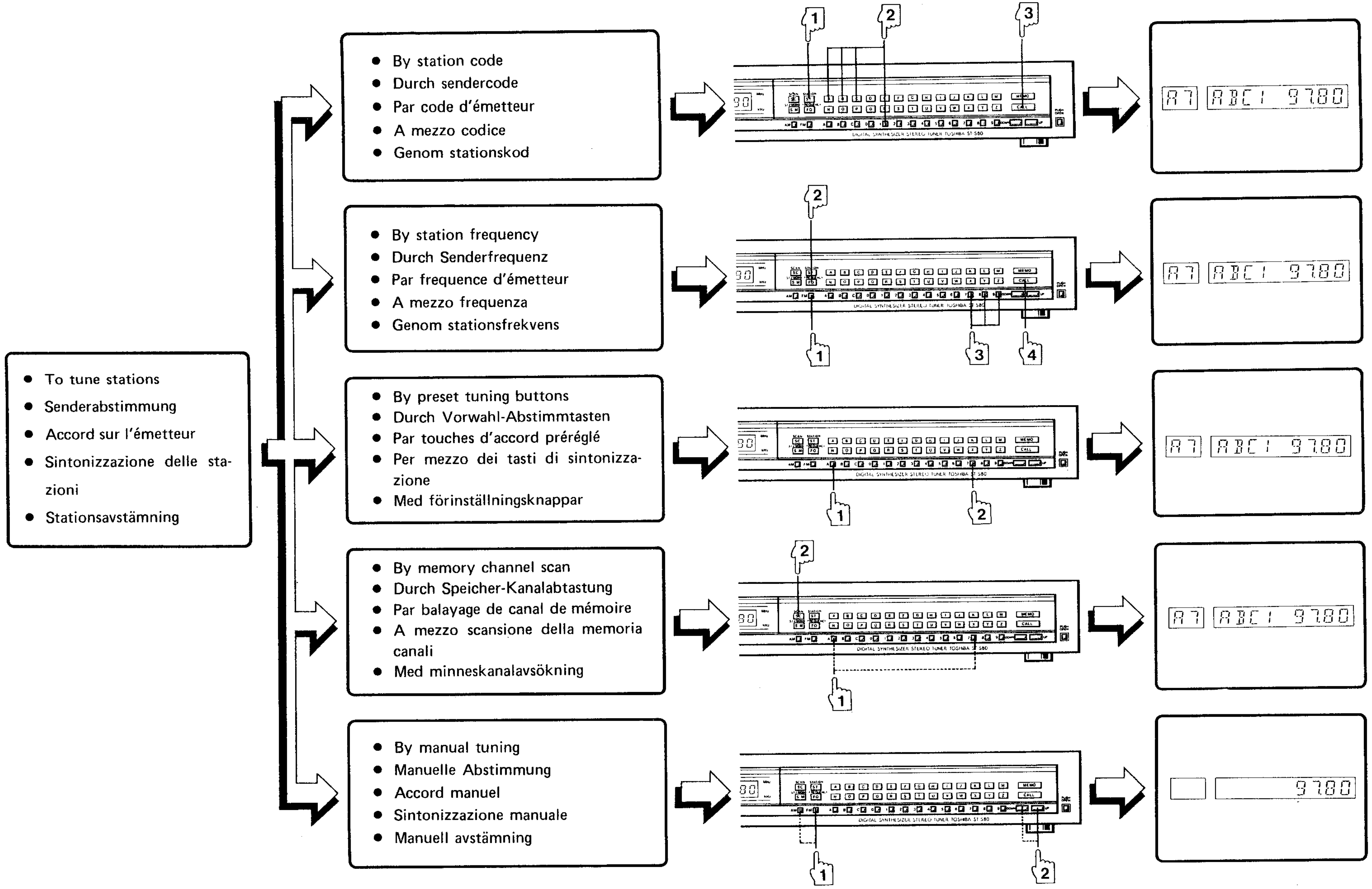
- If a station frequency outside the frequency band range of the ST-S80 is put into the memory or tuned with the [CALL] button, a fixed frequency at the lower end of the frequency band (87.5 MHz for FM, 522 kHz for AM) is automatically stored or tuned.

Example:

FM
- Depress [FQ] [1] [0] [9] [0] [CALL] ———— 87.5 MHz is tuned and appears in display.
- Depress [FQ] [7] [6] [5] [MEMO] [A] [3] ——— 87.5 MHz is stored in preset frame A3.

AM
- Depress [FQ] [4] [2] [3] [CALL] —————— 522 kHz is tuned and appears in display.
- Depress [FQ] [1] [7] [0] [1] [MEMO] [B] [4] ——— 522 kHz is stored in preset frame B4.

- If there is a pause longer than eight seconds during these operations, the display returns to its previous reading.



- To tune stations
- Senderabstimmung
- Accord sur l'émetteur
- Sintonizzazione delle stazioni
- Stationsavstämning

- By station code
- Durch sendercode
- Par code d'émetteur
- A mezzo codice
- Genom stationskod

- By station frequency
- Durch Senderfrequenz
- Par frequence d'émetteur
- A mezzo frequenza
- Genom stationsfrekvens

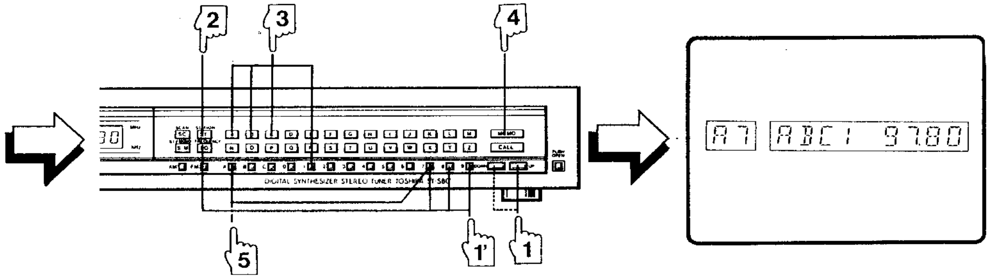
- By preset tuning buttons
- Durch Vorwahl-Abstimmtasten
- Par touches d'accord préréglé
- Per mezzo dei tasti di sintonizzazione
- Med förinställningsknappar

- By memory channel scan
- Durch Speicher-Kanalabtastung
- Par balayage de canal de mémoire
- A mezzo scansione della memoria canali
- Med minneskanalavsökning

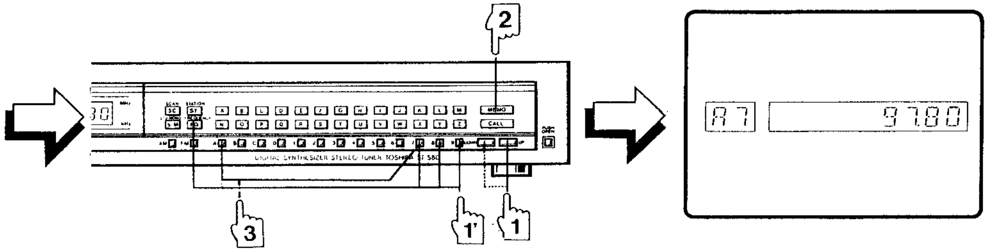
- By manual tuning
- Manuelle Abstimmung
- Accord manuel
- Sintonizzazione manuale
- Manuell avstämning

- To store stations in memory
- Eingabe von Sendern in den Speicher
- Mémorisation des émetteurs
- Memorizzazione di stazioni
- Att lagra station i minnet

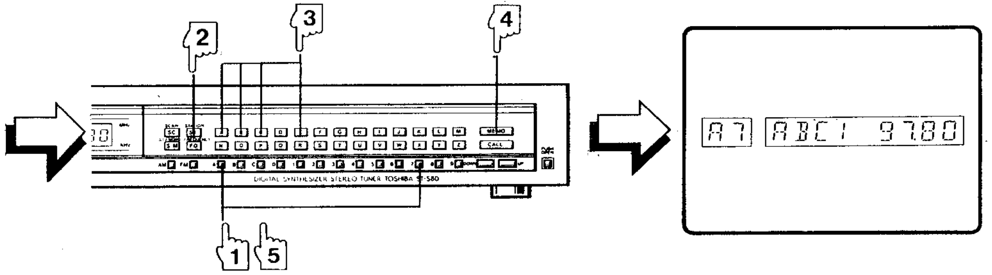
- To store both station code and frequency
- Eingabe von den Sendercode und Frequenz
- Mémorisation du code et de la fréquence d'émetteur
- Memorizzazione del codice e della frequenza
- För att lagra både stations kod och frekvens



- To store station frequency
- Eingabe der Senderfrequenz
- Mémorisation de la fréquence d'émetteur
- Memorizzazione della frequenza
- För att lagra stationsfrekvens



- To add station code to a stored station frequency
- Hinzfügung des Sendercodes zu einer gespreicherten Senderfrequenz
- Pour ajouter le code d'émetteur à la fréquence d'émetteur mémorisée
- Aggiunta del codice ad una stazione gia memorizzata a mezzo frequenza
- Att lägga till stationskod för en lagrad stationsfrekvens



3. DISASSEMBLY INSTRUCTIONS

TOP COVER REMOVAL

1. Remove 5 screws Ⓐ, Ⓑ and Ⓒ to detach the top cover.

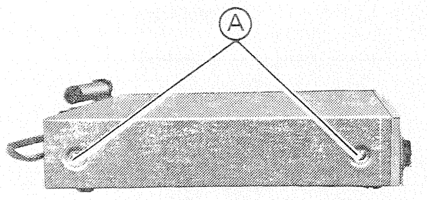


Figure 4.

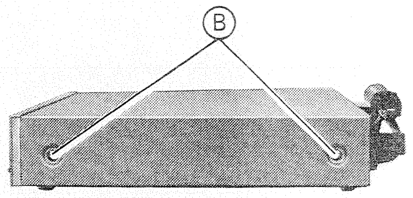
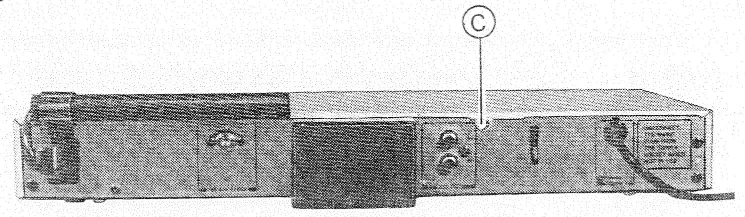
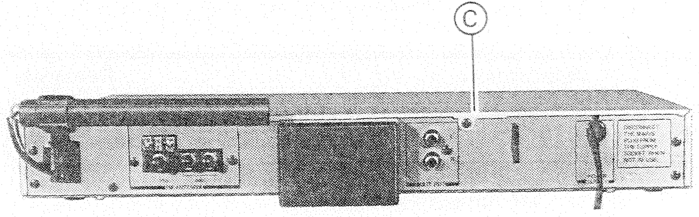


Figure 5.



(TE) Figure 6.



(TU) Figure 7.

FRONT PANEL REMOVAL

1. Remove 2 screws Ⓓ.
2. Remove 3 plastic rivets Ⓔ to detach the front panel.

BOTTOM COVER REMOVAL

1. Remove 7 screws Ⓕ to detach the bottom cover.

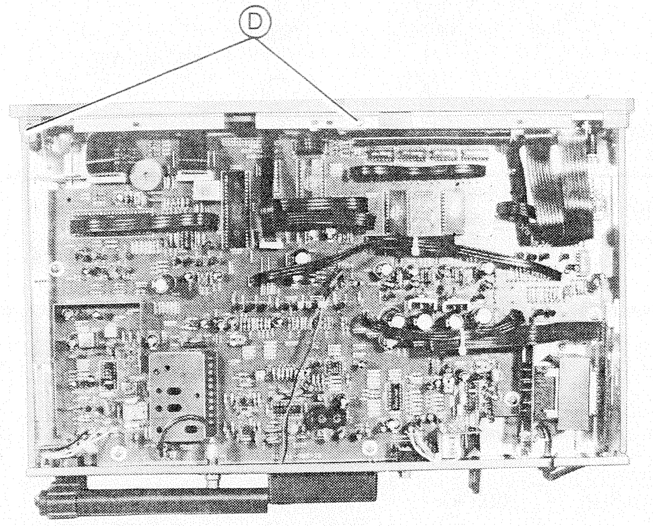


Figure 8.

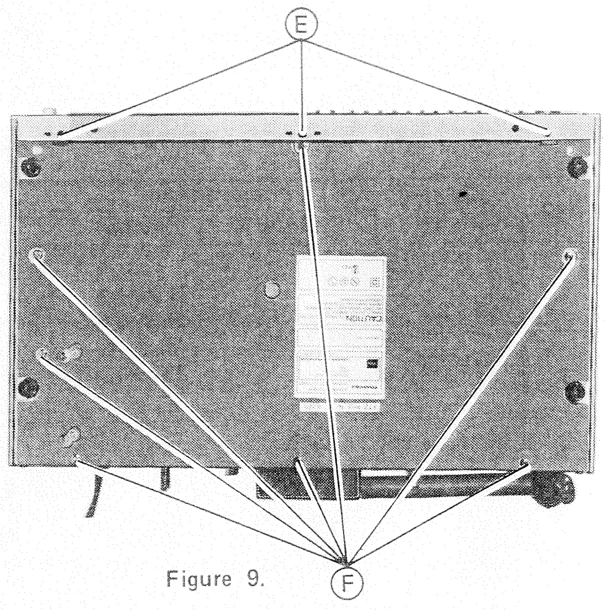
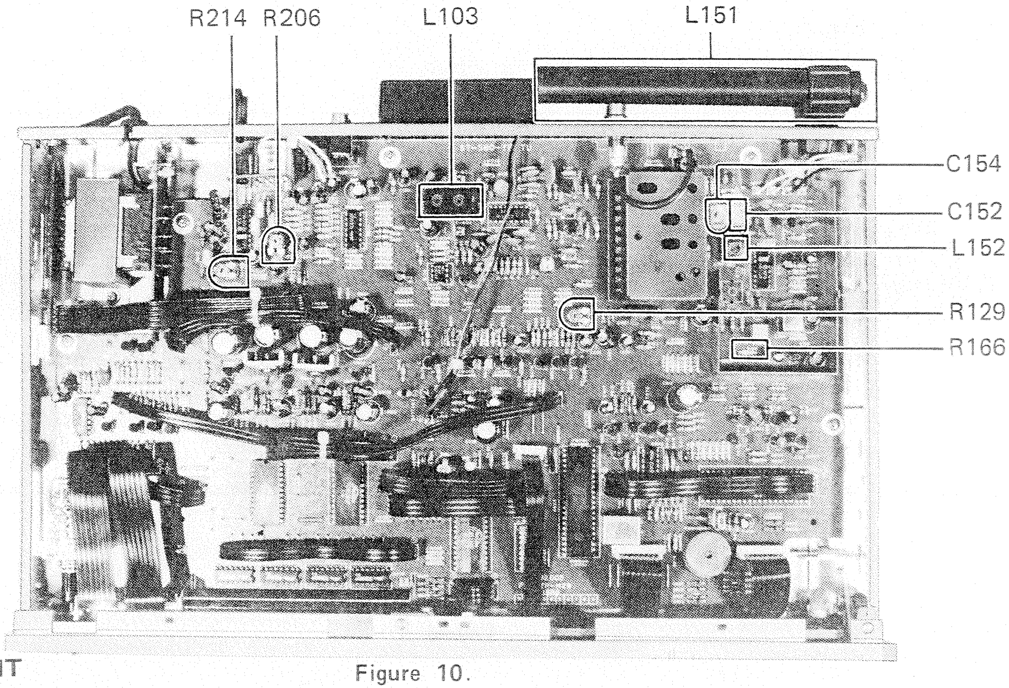


Figure 9.

4. ALIGNMENT INSTRUCTIONS


R214
R206
L103
L151
C154
C152
L152
R129
R166

AM ADJUSTMENT

Figure 10.

IF ADJUSTMENT

Step	Adjustment	Remarks
IF Response	T102	Adjust for scope pattern with specified marker (450 KHz) as illustrated in Figure 11.

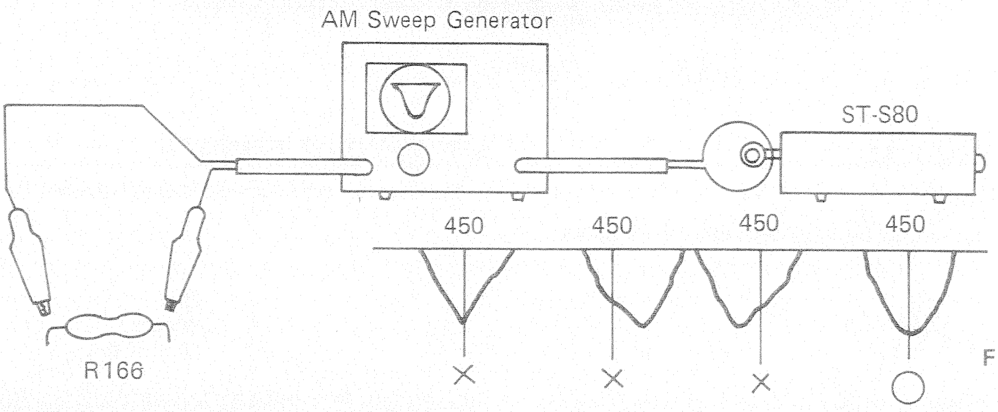

AM Sweep Generator
ST-S80
450
450
450
450
R166
×
×
×
○

Figure 11.

AM FREQUENCY COVERAGE AND TRACKING ADJUSTMENT

Step	Adjusting Circuit	Connection		SG Frequency	Display Frequency	Adjustment	Best Condition
		Input	Output				
1	OSC (Frequency Coverage)	No Signal	Connect D.C. Volt Meter to TP. AMVD		522 kHz	L152 (RED) AM OSC Coil	Best Condition TP (AMVD) 1.5V
2					1602 kHz	C154 AM OSC Trim (Left)	Best Condition TP (AMVD) 20V
3	Repeat steps 1 and 2.						
4	ANT (Tracking)	Connect signal generator to test loop	Connect VTVM to output terminal.	603 kHz (400 Hz 30% MOD.)	603 kHz	L151 Ferrite Ant. Coil	Best Condition VTVM
5				1404 kHz (400 Hz 30% MOD.)	1404 kHz	C152 AM ANT Trim. (Right)	
6	Repeat steps 4 and 5.						

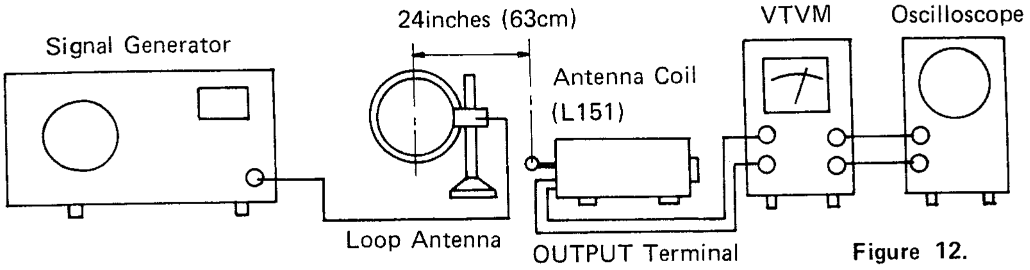

Signal Generator
24inches (63cm)
VTVM
Oscilloscope
Antenna Coil
(L151)
Loop Antenna
OUTPUT Terminal

Figure 12.

FM ADJUSTMENT

Test equipments/Tools required

1. Distortion meter
2. Signal generator
3. Oscilloscope
4. VTVM
5. FM dummy antenna (300 ohms)
6. Dummy load resistor
7. Network
8. Adjusting screwdriver
9. Adjusting bar
10. Tuning meter

Step	Adjusting Circuit	Connection		SG Frequency	Display Frequency	Adjustment	Best Condition
		Input	Output				
1	IF Center Frequency Adjustment (MONO)	Connect FM signal generator to FM antenna terminal. Connect the modulator to signal generator	Connect Tuning Meter to TP. S-ADJ.	98.0 MHz	98.00 MHz	L103 (Right)	Adjust tuning meter pointer so as to keep center.
2	IF Distortion Adjustment (MONO)	Connect FM signal generator to FM antenna terminal. Connect the modulator to signal generator	Connect VTVM oscilloscope and distortion meter to output terminal. Connect Tuning Meter to TP. S-ADJ	98.0 MHz	98.00 MHz	L103 (Left)	Distortion Minimum 0.6%. Adjust tuning meter pointer so as to keep center.
3	Signal LED Adjustment	Connect FM signal generator to FM Antenna Terminal		98.0 MHz 55 dB	98.00 MHz	R129	Adjust for 5 LEDs to light.
				98.0 MHz 50 ~ 55 dB			Adjust for 5th LED not to light
				No Signal			All LEDs don't light

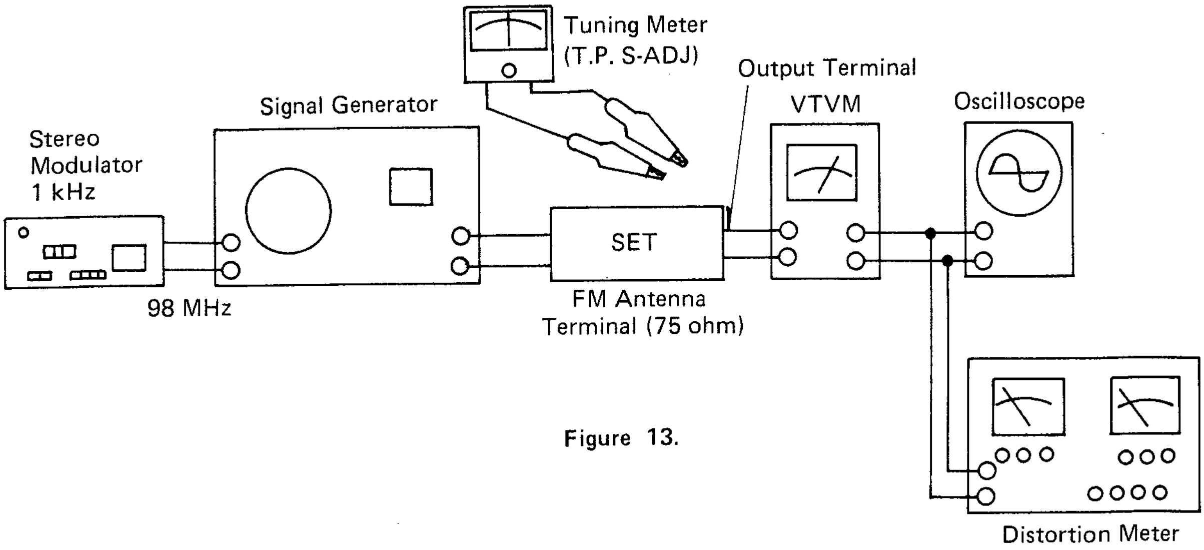

Tuning Meter
(T.P. S-ADJ)
Output Terminal
Signal Generator
VTVM
Oscilloscope
Stereo
Modulator
1 kHz
SET
98 MHz
FM Antenna
Terminal (75 ohm)
Distortion Meter

Figure 13.

FM MPX ADJUSTMENT

Pilot signal adjustment	Connect Frequency Counter to the TP. MPX-VCO (with 220K ohm series Resistor) and adjust the Semifixed Resistor R214 for 76.00 kHz reading counter with No Signal Input.
Separation adjustment	Receive the stereo signal and adjust the R206 for maximum channel separation. Note: Signal frequency: 98 MHz (60 dB) Frequency deviation: Pilot Signal 6 kHz L and R signals: 40 kHz Cut filter: 19 kHz

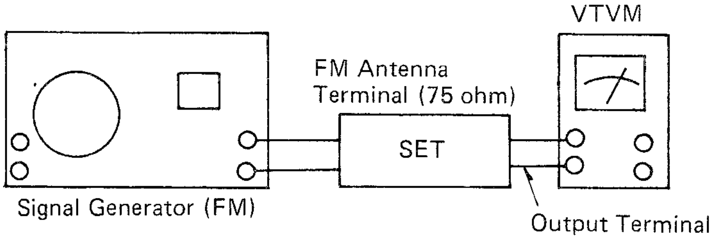
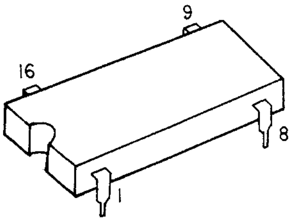

VTVM
FM Antenna Terminal (75 ohm)
SET
Signal Generator (FM)
Output Terminal

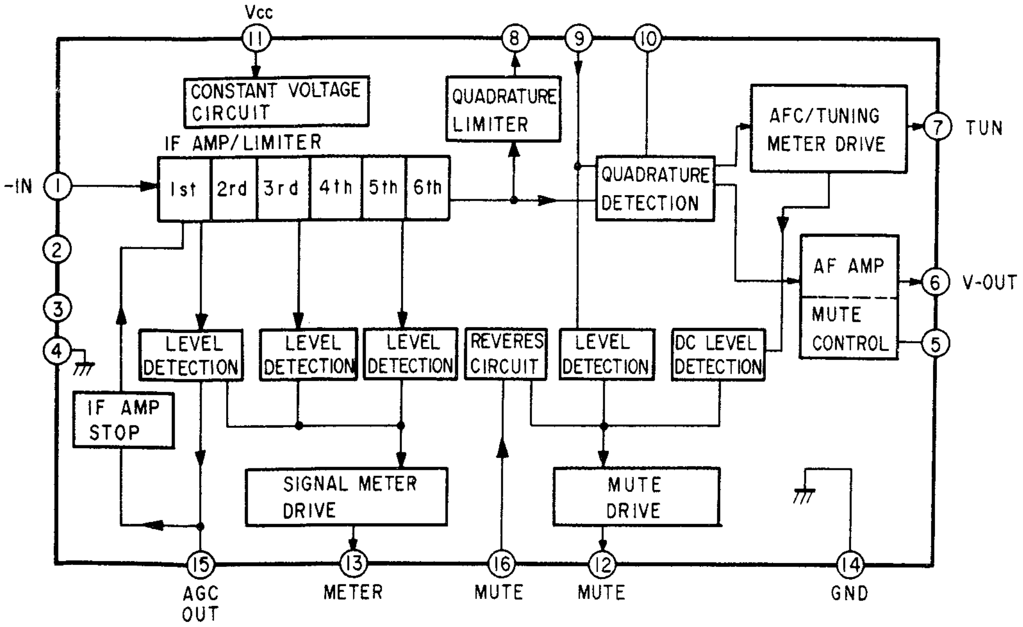
Figure 14.

CAUTION: When realigning the FM Receiving Frequency, the lower side of the frequency range must not be below 87.5 MHz in order to comply with FTZ regulations in West Germany.

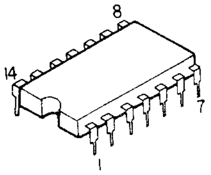
5. IC BLOCK DIAGRAM

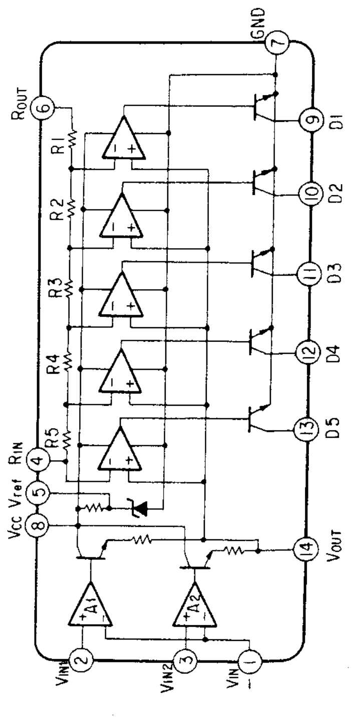
A1231



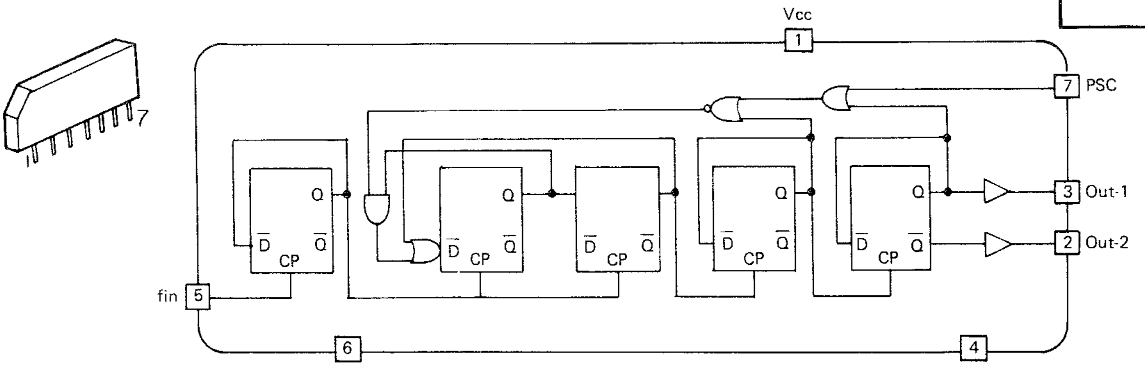

Vcc
11
8
9
10
CONSTANT VOLTAGE CIRCUIT
QUADRATURE LIMITER
IF AMP/LIMITER
AFC/TUNING METER DRIVE
7 TUN
-IN 1
1st
2rd
3rd
4th
5th
6th
QUADRATURE DETECTION
2
3
4
AF AMP
MUTE CONTROL
6 V-OUT
5
LEVEL DETECTION
LEVEL DETECTION
LEVEL DETECTION
REVERES CIRCUIT
LEVEL DETECTION
DC LEVEL DETECTION
IF AMP STOP
SIGNAL METER DRIVE
MUTE DRIVE
15 AGC OUT
13 METER
16 MUTE
12 MUTE
14 GND

TA7654P

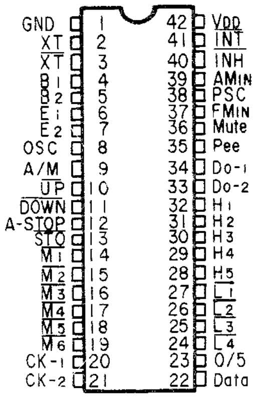


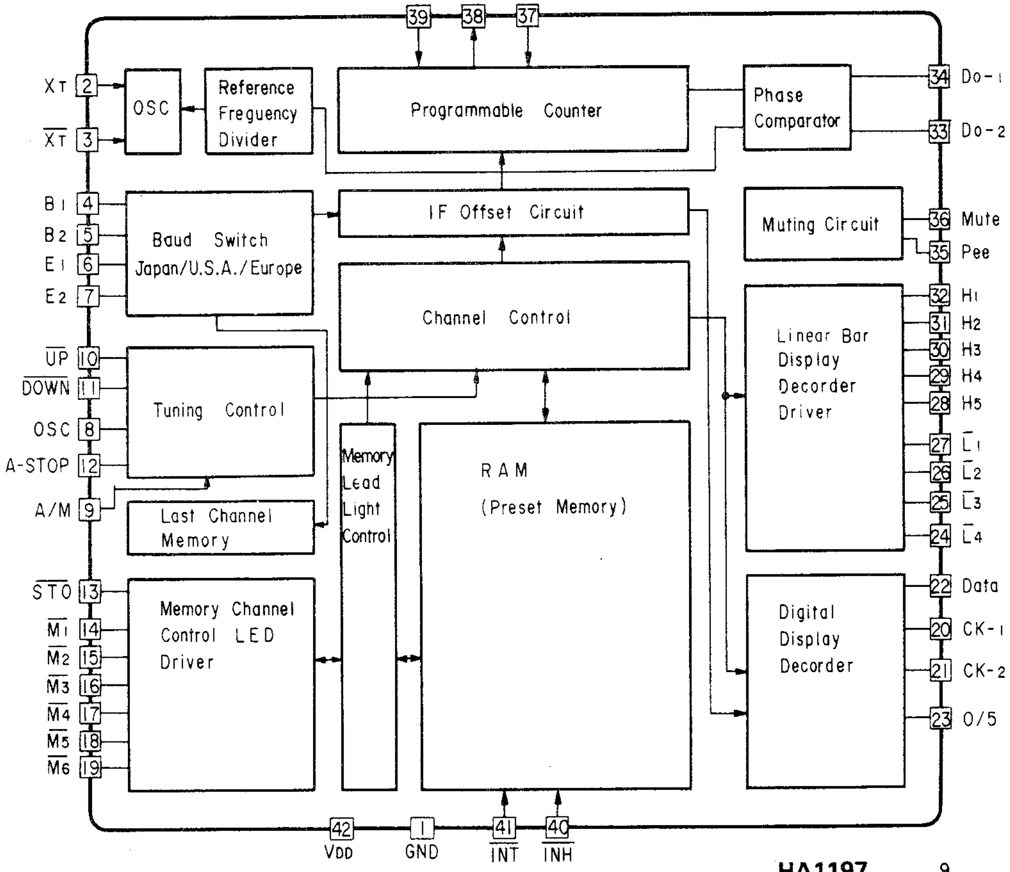

GND 7
ROUT 6
R1
R2
R3
R4
R5
RIN 4
Vcc Vref 5
8
9 D1
10 D2
11 D3
12 D4
13 D5
14 VOUT
A1
A2
VIN1 2
VIN2 3
VIN 1

TD6104P

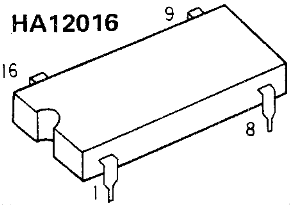

7
1
Vcc
1
7 PSC
3 Out-1
2 Out-2
fin 5
6 BIAS
4 GND
Q
D̄
Q̄
CP

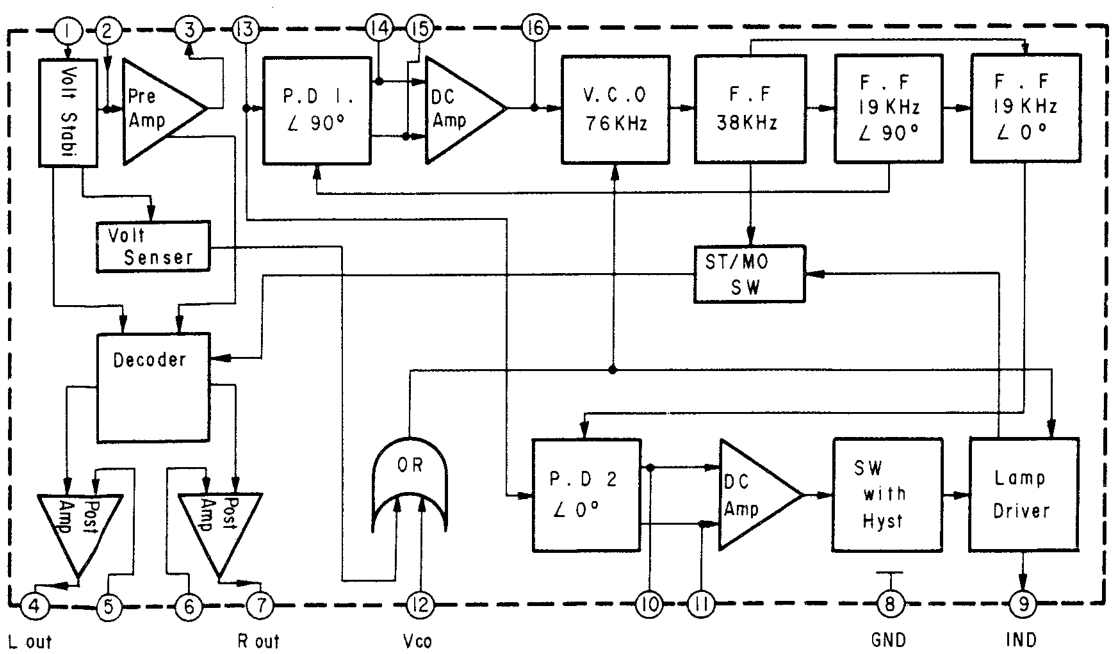
TC9137P


GND 1
XT 2
X̄T 3
B1 4
B2 5
E1 6
E2 7
OSC 8
A/M 9
ŪP 10
DOWN 11
A-STOP 12
STO 13
M1 14
M2 15
M3 16
M4 17
M5 18
M6 19
CK-1 20
CK-2 21
42 VDD
41 INT
40 INH
39 AMIN
38 PSC
37 FMIN
36 Mute
35 Pee
34 Do-1
33 Do-2
32 H1
31 H2
30 H3
29 H4
28 H5
27 L1
26 L2
25 L3
24 L4
23 0/5
22 Data

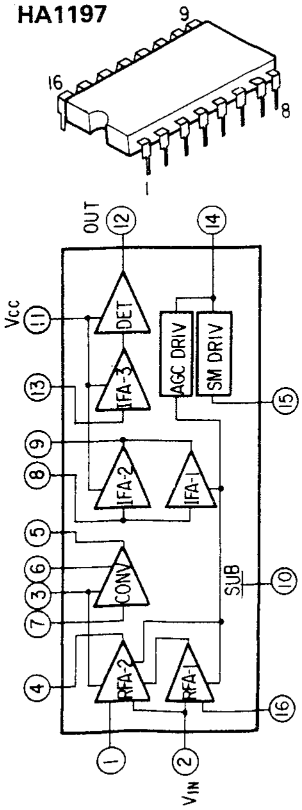

AMIN 39
PSC 38
FMIN 37
XT 2
X̄T 3
OSC
Reference Freguency Divider
Programmable Counter
Phase Comparator
34 Do-1
33 Do-2
B1 4
B2 5
E1 6
E2 7
Baud Switch Japan/U.S.A./Europe
IF Offset Circuit
Muting Circuit
36 Mute
35 Pee
Channel Control
Linear Bar Display Decorder Driver
32 H1
31 H2
30 H3
29 H4
28 H5
27 L1
26 L2
25 L3
24 L4
UP 10
DOWN 11
OSC 8
A-STOP 12
A/M 9
Tuning Control
Last Channel Memory
Memory Lead Light Control
RAM (Preset Memory)
STO 13
M1 14
M2 15
M3 16
M4 17
M5 18
M6 19
Memory Channel Control LED Driver
Digital Display Decorder
22 Data
20 CK-1
21 CK-2
23 0/5
42 VDD
1 GND
41 INT
40 INH

HA12016

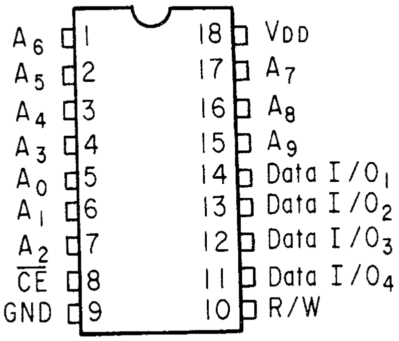



Vcc
VIN
LPF
Vco
①
②
③
⑬
⑭
⑮
⑯
Volt Stabi
Pre Amp
P.D 1. ∠ 90°
DC Amp
V.C.O 76KHz
F.F 38KHz
F.F 19KHz ∠ 90°
F.F 19KHz ∠ 0°
Volt Senser
ST/MO SW
Decoder
OR
P.D 2 ∠ 0°
DC Amp
SW with Hyst
Lamp Driver
Post Amp
Post Amp
④
⑤
⑥
⑦
⑫
⑩
⑪
⑧
⑨
L out
R out
Vco
GND
IND

HA1197


9
16
8
1
OUT ⑫
⑭
Vcc ⑪
⑬
⑨
⑧
⑤
⑥
③
⑦
④
①
② VIN
⑮
⑩
⑯
DET
IFA-3
AGC DRIV
SM DRIV
IFA-2
IFA-1
CONV
RFA-2
RFA-1
SUB

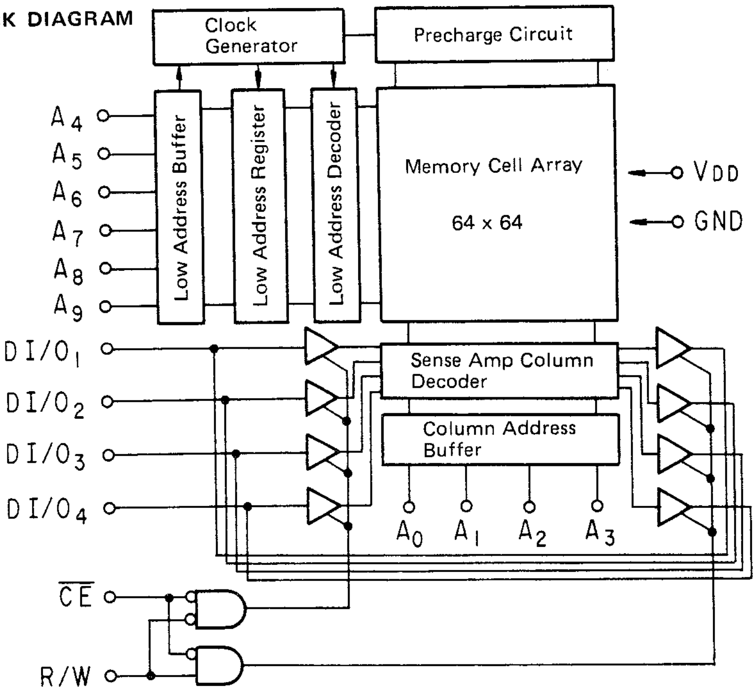
TC5514P


A6 1
A5 2
A4 3
A3 4
A0 5
A1 6
A2 7
CE 8
GND 9
18 VDD
17 A7
16 A8
15 A9
14 Data I/O1
13 Data I/O2
12 Data I/O3
11 Data I/O4
10 R/W

PIN NAME

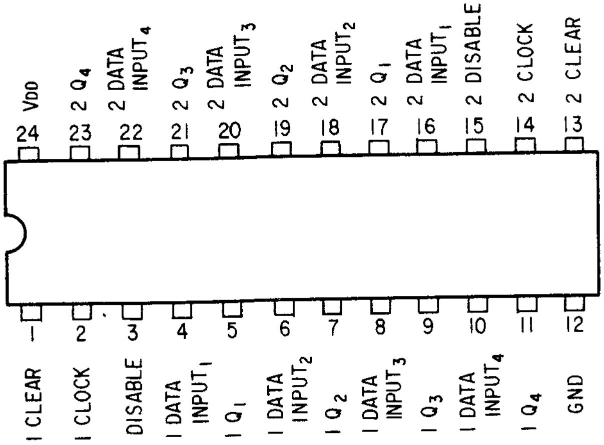
$A_0 \sim A_9$	Address Input
R / W	Lead Light Input
CE	Tip Enable Input
Data $I/O_{1\sim4}$	Data Input Output
V_{DD}/GND	Power Source

BLOCK DIAGRAM


Clock Generator
Precharge Circuit
A4
A5
A6
A7
A8
A9
Low Address Buffer
Low Address Register
Low Address Decoder
Memory Cell Array
64 x 64
VDD
GND
DI/O1
DI/O2
DI/O3
DI/O4
Sense Amp Column Decoder
Column Address Buffer
A0
A1
A2
A3
CE
R/W

TC4508BP

PIN CONNECTION DIAGRAM

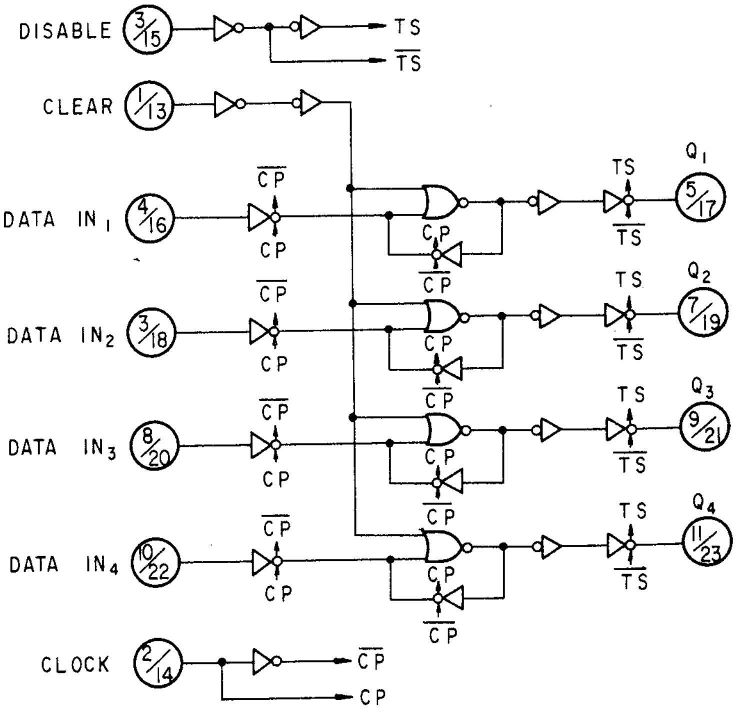

VDD 24
2 Q4 23
2 DATA INPUT4 22
2 Q3 21
2 DATA INPUT3 20
2 Q2 19
2 DATA INPUT2 18
2 Q1 17
2 DATA INPUT1 16
2 DISABLE 15
2 CLOCK 14
2 CLEAR 13
1 1 CLEAR
2 1 CLOCK
3 1 DISABLE
4 1 DATA INPUT1
5 1 Q1
6 1 DATA INPUT2
7 1 Q2
8 1 DATA INPUT3
9 1 Q3
10 1 DATA INPUT4
11 1 Q4
12 GND

TRUTH TABLE

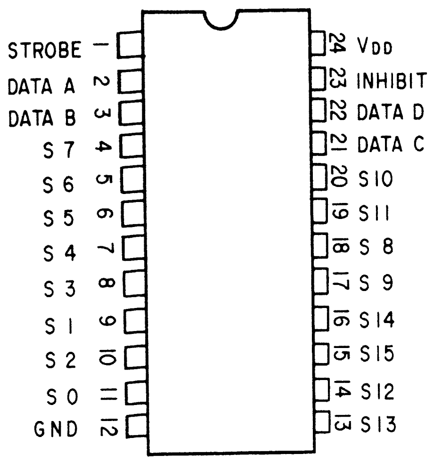
CLEAR	CLOCK	DIS-ABLE	DATA INPUTS				OUTPUTS			
			D_1	D_2	D_3	D_4	Q_1	Q_2	Q_3	Q_4
*	*	H	*	*	*	*	HZ			
H	*	L	*	*	*	*	L	L	L	L
L	L	L	*	*	*	*	LATCHED			
L	H	L	A	B	C	D	A	B	C	D

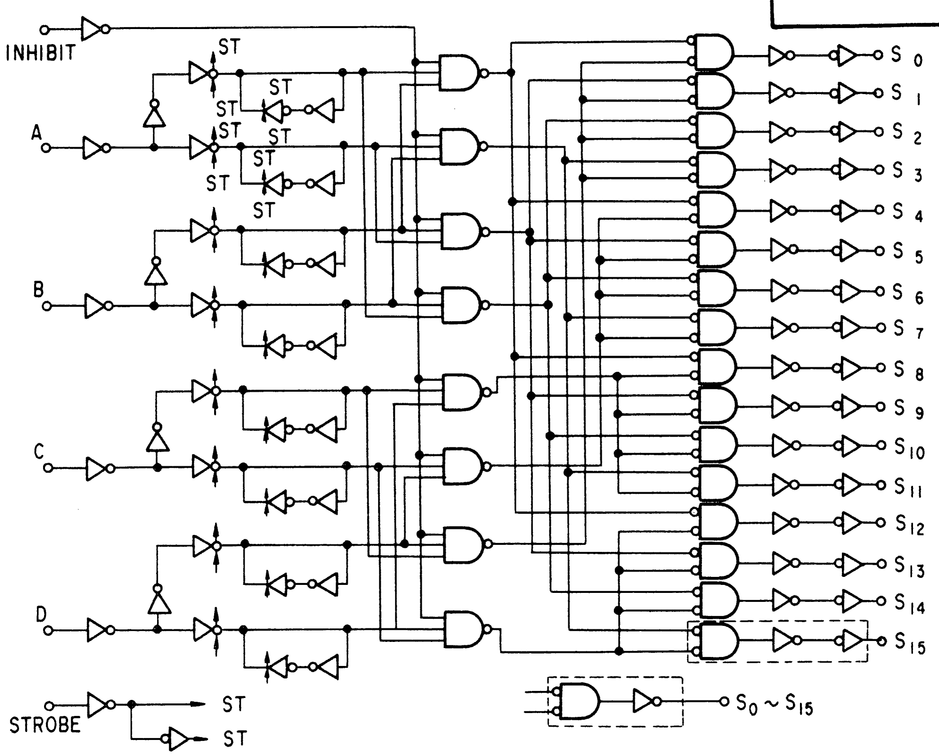
*; Don't Care
HZ; High Impedance

LOGIC DIAGRAM


DISABLE 3/15
TS
$\overline{TS}$
CLEAR 1/13
DATA IN1 4/16
DATA IN2 3/18
DATA IN3 8/20
DATA IN4 10/22
$\overline{CP}$
CP
TS
$\overline{TS}$
Q1 5/17
Q2 7/19
Q3 9/21
Q4 11/23
CLOCK 2/14
$\overline{CP}$
CP

TC4514BP


STROBE 1
DATA A 2
DATA B 3
S 7 4
S 6 5
S 5 6
S 4 7
S 3 8
S 1 9
S 2 10
S 0 11
GND 12
24 VDD
23 INHIBIT
22 DATA D
21 DATA C
20 S10
19 S11
18 S 8
17 S 9
16 S14
15 S15
14 S12
13 S13

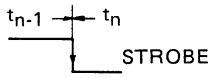

INHIBIT
A
B
C
D
STROBE
ST
S0
S1
S2
S3
S4
S5
S6
S7
S8
S9
S10
S11
S12
S13
S14
S15
S0 ~ S15

TRUTH TABLE

INHIBIT	DATA INPUT				SELECTED OUTPUT TC4514P – "H" TC4515P – "L"
	D	C	B	A	
L	L	L	L	L	S_0
L	L	L	L	H	S_1
L	L	L	H	L	S_2
L	L	L	H	H	S_3
L	L	H	L	L	S_4
L	L	H	L	H	S_5
L	L	H	H	L	S_6
L	L	H	H	H	S_7
L	H	L	L	L	S_8
L	H	L	L	H	S_9
L	H	L	H	L	S_{10}
L	H	L	H	H	S_{11}
L	H	H	L	L	S_{12}
L	H	H	L	H	S_{13}
L	H	H	H	L	S_{14}
L	H	H	H	H	S_{15}
H	★	★	★	★	TC4514P-ALL OUTPUTS "L" TC4515P-ALL OUTPUTS "H"

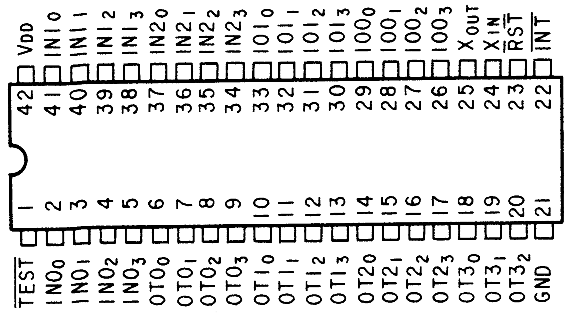
NOTE 1. ★ Any of "H" and "L" is good.

2. ○ STROBE = "H"
Subject to truth table.
○ STROBE = "L"


t_{n-1}
t_n
STROBE

At t_n, $S_{0\sim15}$ hold the final data of t_{n-1}.

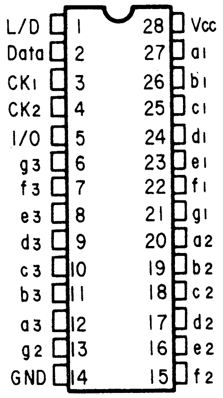
TMP4320 AP-6501

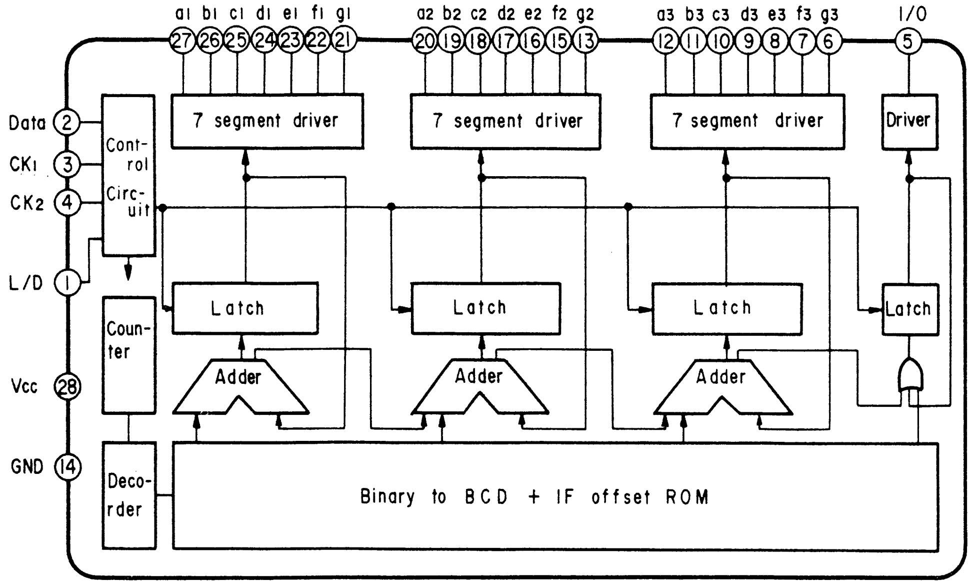

VDD 42
IN1₀ 41
IN1₁ 40
IN1₂ 39
IN1₃ 38
IN2₀ 37
IN2₁ 36
IN2₂ 35
IN2₃ 34
IO1₀ 33
IO1₁ 32
IO1₂ 31
IO1₃ 30
IO0₀ 29
IO0₁ 28
IO0₂ 27
IO0₃ 26
XOUT 25
XIN 24
RST 23
INT 22
TEST 1
IN0₀ 2
IN0₁ 3
IN0₂ 4
IN0₃ 5
OT0₀ 6
OT0₁ 7
OT0₂ 8
OT0₃ 9
OT1₀ 10
OT1₁ 11
OT1₂ 12
OT1₃ 13
OT2₀ 14
OT2₁ 15
OT2₂ 16
OT2₃ 17
OT3₀ 18
OT3₁ 19
OT3₂ 20
GND 21

PIN NAME/FUNCTION

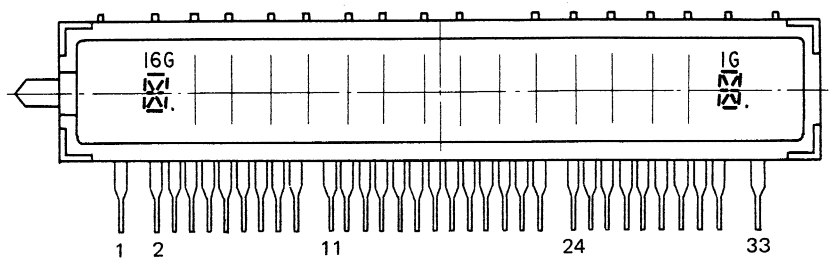
Pin	Input/Output	Function
$IN0_0 \sim IN0_3$	Input	Input Port IN0
$IN1_0 \sim IN1_3$	Input	Input Port IN1
$IN2_0 \sim IN2_3$	Input	Input Port IN2
$OT0_0 \sim OT0_3$	Output	Output Port OT0
$OT1_0 \sim OT1_3$	Output	Output Port OT1
$OT2_0 \sim OT2_3$	Output	Output Port OT2
$OT3_0 \sim OT3_2$	Output	Output Port OT3
$IO0_0 \sim IO0_3$	Input/Output	Input/Output Port IO0
$IO1_0 \sim IO1_3$	Input/Output	Input/Output Port IO1
$\overline{RST}$	Input	Initialize Signal Input
$\overline{INT}$	Input	Offering Signal Input
X_{IN}	Input	Basic Clock Terminal
X_{OUT}	Output	Basic Clock Terminal
$\overline{TEST}$	Input	LSI Test Input
V_{DD}		5V (Power Source)
GND		0V (Power Source)

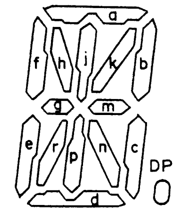
TC5066BP


L/D 1
Data 2
CK1 3
CK2 4
I/O 5
g3 6
f3 7
e3 8
d3 9
c3 10
b3 11
a3 12
g2 13
GND 14
28 Vcc
27 a1
26 b1
25 c1
24 d1
23 e1
22 f1
21 g1
20 a2
19 b2
18 c2
17 d2
16 e2
15 f2


a1 b1 c1 d1 e1 f1 g1
27 26 25 24 23 22 21
a2 b2 c2 d2 e2 f2 g2
20 19 18 17 16 15 13
a3 b3 c3 d3 e3 f3 g3
12 11 10 9 8 7 6
I/O
5
Data 2
CK1 3
CK2 4
L/D 1
Vcc 28
GND 14
Control Circuit
Counter
Decorder
7 segment driver
7 segment driver
7 segment driver
Driver
Latch
Latch
Latch
Latch
Adder
Adder
Adder
Binary to BCD + IF offset ROM

F1P16A5R


16G
1G
1
2
11
24
33

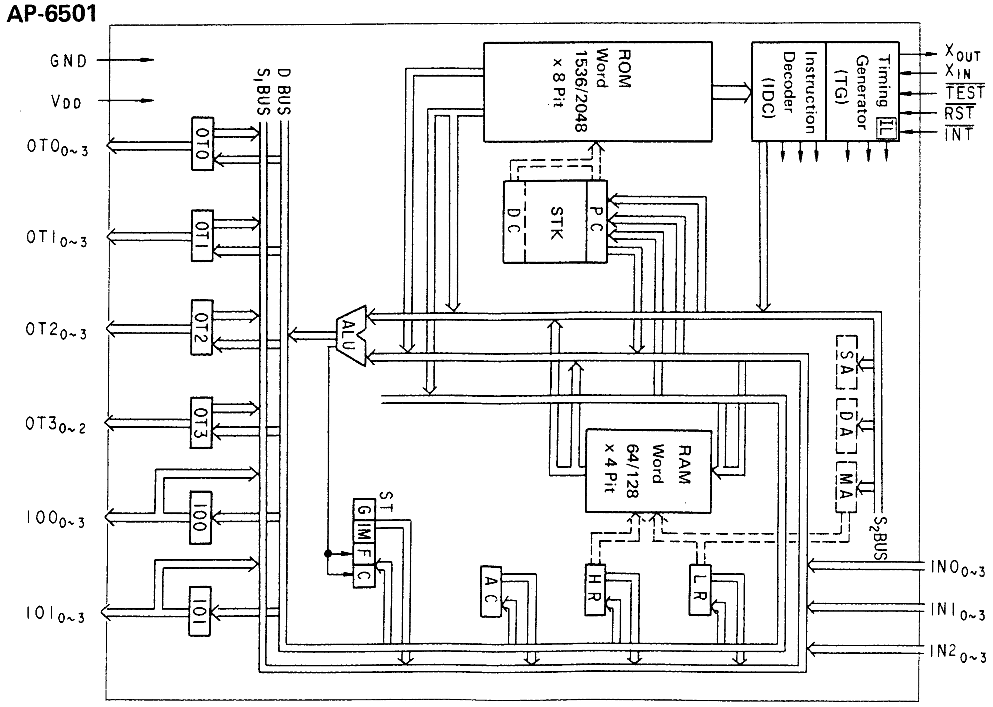

a
b
c
d
e
f
g
h
i
j
k
m
n
p
r
DP

DISPLAY PATTERN

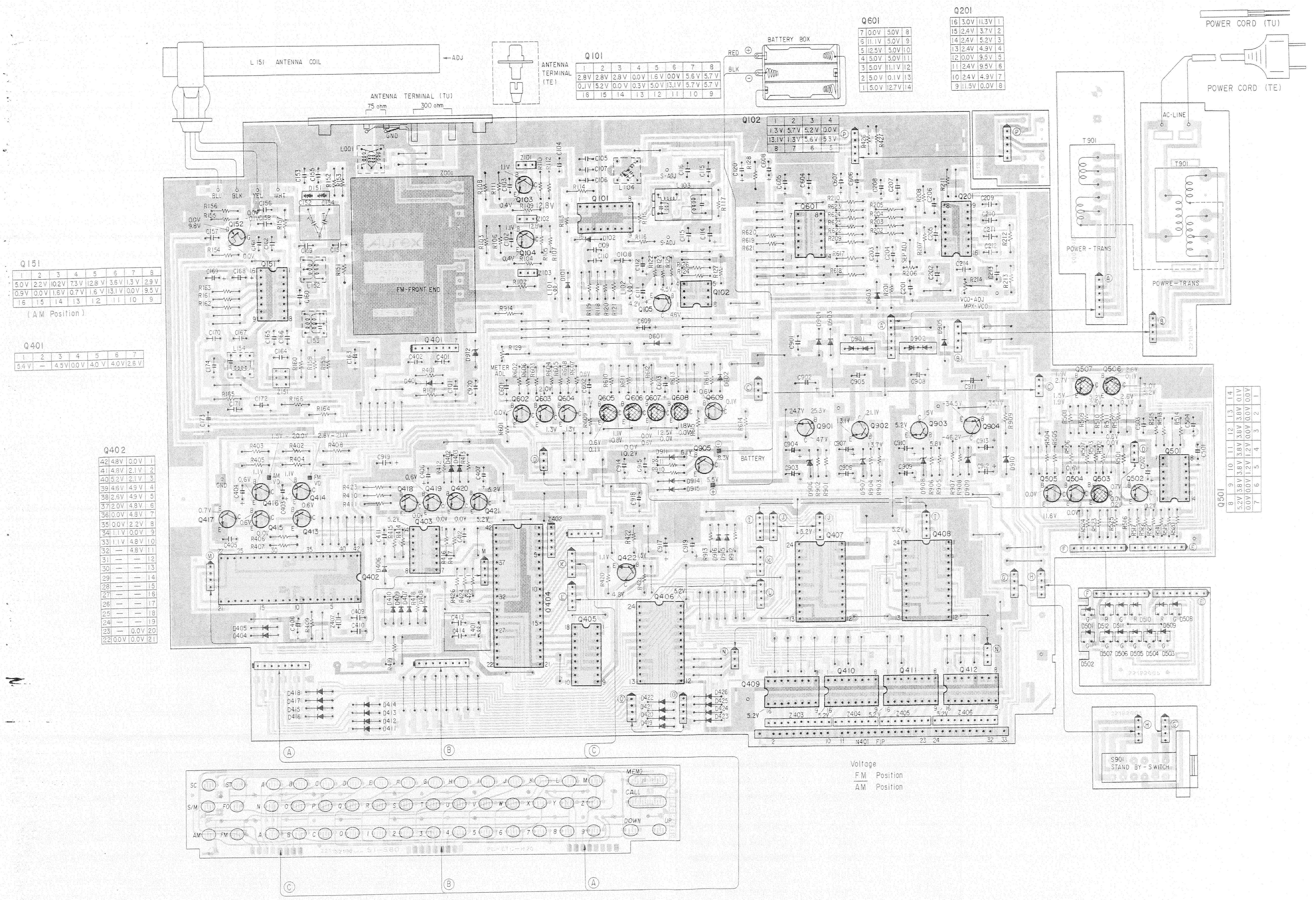
ELECTRODE CONNECTION

Terminal No.	1	2	3	4	5	6	7	8	9	10	11
Electrode Connected	F	16G	P(f)	15G	P(g)	14G	P(e)	13G	P(r)	12G	P(p)
Terminal No.	12	13	14	15	16	17	18	19	20	21	22
Electrode Connected	11G	P(n)	10G	P(d)	9G	P(DP)	8G	P(c)	7G	P(m)	6G
Terminal No.	23	24	25	26	27	28	29	30	31	32	33
Electrode Connected	P(h)	5G	P(j)	4G	P(k)	3G	P(b)	2G	P(a)	1G	F

TMP4320 AP-6501


GND
VDD
OT0₀~₃
OT1₀~₃
OT2₀~₃
OT3₀~₂
IO0₀~₃
IO1₀~₃
D BUS
S₁BUS
OT0
OT1
OT2
OT3
IO0
IO1
ROM Word 1536/2048 x 8 Bit
Instruction Decoder (IDC)
Timing Generator (TG)
IL
XOUT
XIN
TEST
RST
INT
STK
PC
DC
ALU
SA
DA
MA
RAM Word 64/128 x 4 Bit
ST
G M F C
AC
HR
LR
S₂BUS
IN0₀~₃
IN1₀~₃
IN2₀~₃

6. ELECTRICAL PARTS LOCATIONS


L151 ANTENNA COIL
ADJ
ANTENNA TERMINAL (TE)
ANTENNA TERMINAL (TU)
75 ohm
300 ohm
BATTERY BOX
RED
BLK
POWER CORD (TU)
POWER CORD (TE)
AC-LINE
T901
POWER-TRANS
POWRE-TRANS
FM-FRONT END
Aurex
Z001
L001
GND
BLU
BLK
YEL
WHT
S-ADJ
SEP ADJ
VCO-ADJ
MPX-VCO
METER ADJ
BATTERY
Q101
Q102
Q103
Q104
Q105
Q151
Q152
Q201
Q401
Q402
Q403
Q404
Q405
Q406
Q407
Q408
Q409
Q410
Q411
Q412
Q413
Q414
Q415
Q416
Q417
Q418
Q419
Q420
Q421
Q422
Q501
Q502
Q503
Q504
Q505
Q506
Q507
Q601
Q602
Q603
Q604
Q605
Q606
Q607
Q608
Q609
Q901
Q902
Q903
Q904
Q905
N401 FIP
S901 STAND BY-SWITCH
MEMO
CALL
DOWN
UP
SC
ST
S/M
FO
AM
FM
A
B
C

Voltage
FM Position
AM Position

Q101

1	2	3	4	5	6	7	8
2.8V	2.8V	2.8V	0.0V	1.6V	0.0V	5.6V	5.7V
0.1V	5.2V	0.0V	0.3V	5.0V	13.1V	5.7V	5.7V
16	15	14	13	12	11	10	9

Q102

1	2	3	4
1.3V	5.7V	5.2V	0.0V
13.1V	1.3V	5.6V	5.3V
8	7	6	5

Q601

7	0.0V	5.0V	8
6	11.1V	5.0V	9
5	12.5V	5.0V	10
4	5.0V	5.0V	11
3	5.0V	11.1V	12
2	5.0V	0.1V	13
1	5.0V	12.7V	14

Q201

16	3.0V	11.3V	1
15	2.4V	3.7V	2
14	2.4V	5.2V	3
13	2.4V	4.9V	4
12	0.0V	9.5V	5
11	2.4V	9.5V	6
10	2.4V	4.9V	7
9	11.5V	0.0V	8

Q151

1	2	3	4	5	6	7	8
5.0V	2.2V	10.2V	7.3V	12.8V	3.6V	1.3V	2.9V
0.9V	0.0V	1.6V	0.7V	1.6V	13.1V	0.0V	9.5V
16	15	14	13	12	11	10	9

(AM Position)

Q401

1	2	3	4	5	6	7
5.4V	—	4.5V	0.0V	4.0V	4.0V	2.6V

Q402

42	4.8V	0.0V	1
41	4.8V	2.1V	2
40	5.2V	2.1V	3
39	4.6V	4.9V	4
38	2.6V	4.9V	5
37	2.0V	4.8V	6
36	0.0V	4.8V	7
35	0.0V	2.2V	8
34	1.1V	0.0V	9
33	1.1V	4.8V	10
32	—	4.8V	11
31	—	—	12
30	—	—	13
29	—	—	14
28	—	—	15
27	—	—	16
26	—	—	17
25	—	—	18
24	—	—	19
23	—	0.0V	20
22	0.0V	0.0V	21

Q501

8	9	10	11	12	13	14
5.2V	3.8V	3.8V	3.8V	3.8V	3.8V	0.1V
0.0V	0.0V	1.2V	1.2V	0.0V	0.0V	0.0V
7	6	5	4	3	2	1

Figure 15.

7. SCHEMATIC DIAGRAM

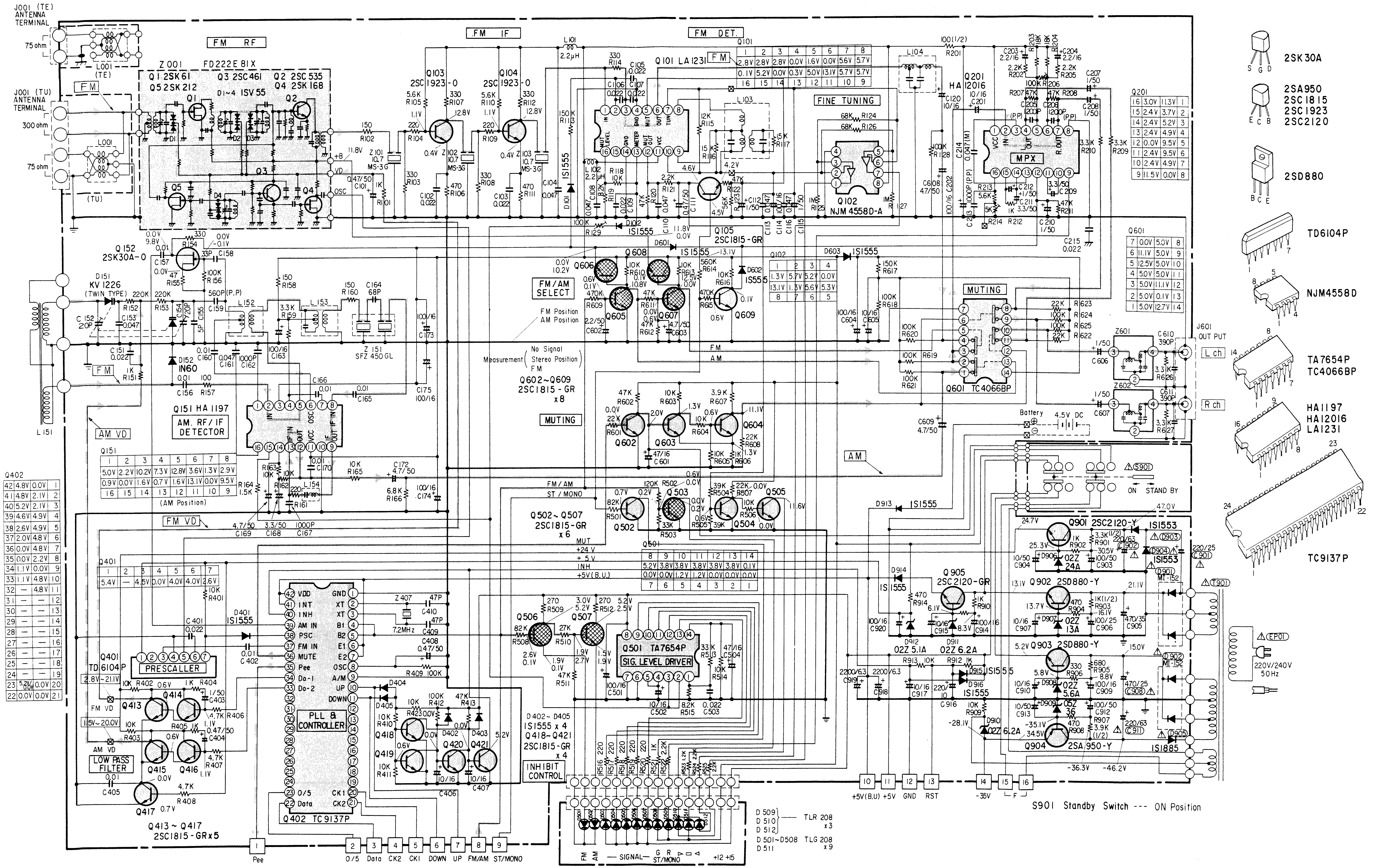

J001 (TE) ANTENNA TERMINAL
75 ohm
J001 (TU) ANTENNA TERMINAL
300 ohm
FM RF
Z001 FD222E81X
Q1 2SK61 Q3 2SC461 Q2 2SC535
Q5 2SK212 Q4 2SK168
D1~4 1SV55
FM IF
Q103 2SC1923-0
Q104 2SC1923-0
FM DET.
Q101 LA1231
FINE TUNING
Q102 NJM4558D-A
Q201 HA12016
MPX
Q105 2SC1815-GR
FM/AM SELECT
FM Position
AM Position
Measurement (No Signal Stereo Position) FM
Q602~Q609 2SC1815-GR x8
MUTING
Q601 TC4066BP
Z601
Z602
J601 OUT PUT
L ch
R ch
Battery 4.5V DC
Q152 2SK30A-0
D151 KV1226 (TWIN TYPE)
D152 1N60
Z151 SFZ450GL
Q151 HA1197
AM. RF/IF DETECTOR
AM VD
FM VD
(AM Position)
Q401 TD6104P
PRESCALLER
LOW PASS FILTER
Q413~Q417 2SC1815-GRx5
Q402 TC9137P
PLL & CONTROLLER
7.2MHz
D402~D405 1S1555 x4
Q418~Q421 2SC1815-GR x4
INHIBIT CONTROL
Q502~Q507 2SC1815-GR x6
Q501 TA7654P
SIG. LEVEL DRIVER
D509, D510, D512 — TLR208 x3
D501~D508, D511 — TLG208 x9
FM AM — SIGNAL — G R ST/MONO +12 +15
Q901 2SC2120-Y
Q905 2SC2120-GR
Q902 2SD880-Y
Q903 2SD880-Y
Q904 2SA950-Y
S901 Standby Switch --- ON Position
ON STAND BY
220V/240V 50Hz
Pee
0/5 Data CK2 CK1 DOWN UP FM/AM ST/MONO
+5V(B.U) +5V GND RST -35V F
2SK30A
S G D
2SA950 2SC1815 2SC1923 2SC2120
E C B
2SD880
B C E
TD6104P
NJM4558D
TA7654P TC4066BP
HA1197 HA12016 LA1231
TC9137P

Figure 16.

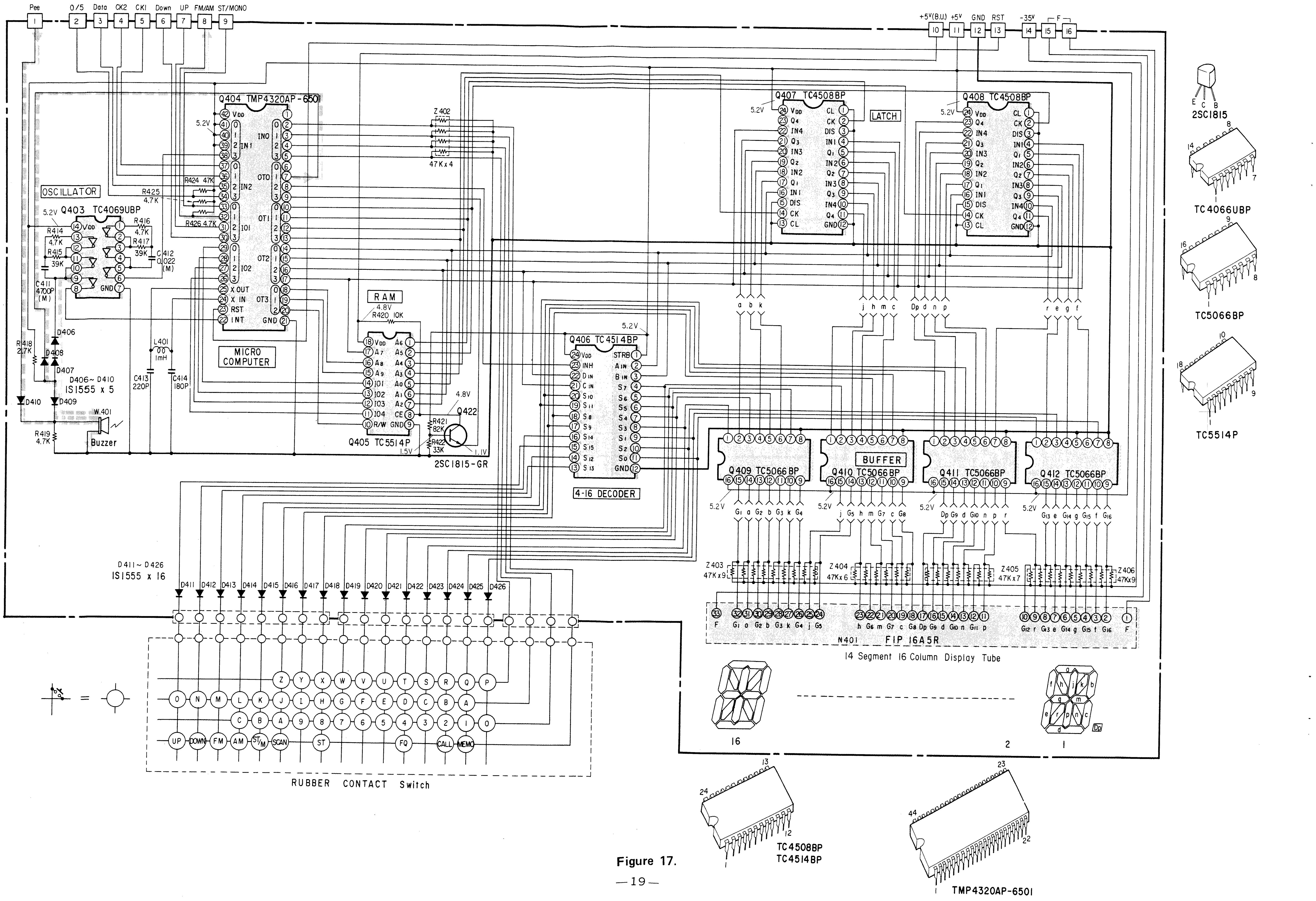
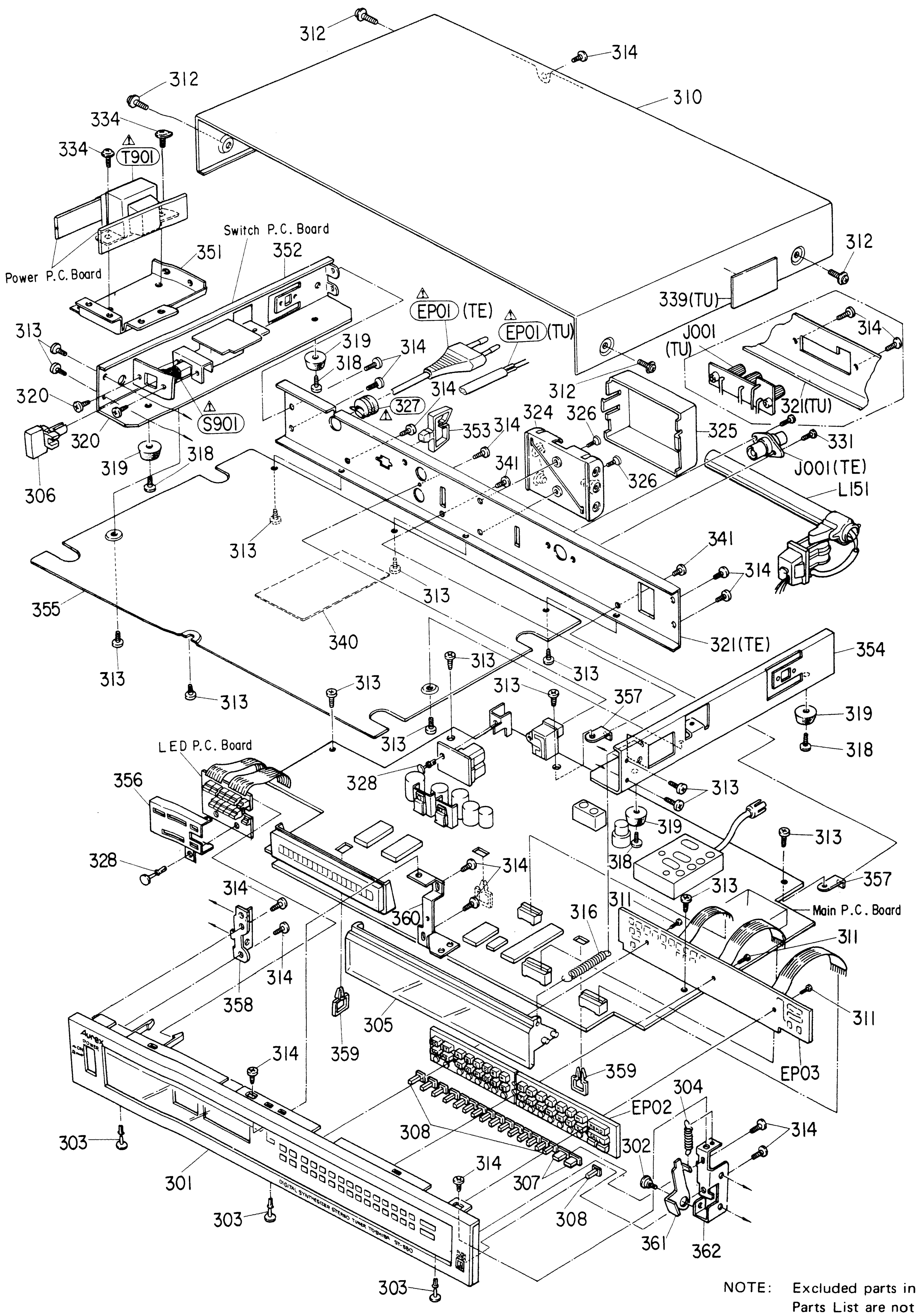

Pee
0/5
Data
CK2
CK1
Down
UP
FM/AM
ST/MONO
+5V(B.U.)
+5V
GND
RST
-35V
F
Q404 TMP4320AP-6501
MICRO COMPUTER
VDD
IN0
IN1
IN2
OT0
OT1
OT2
OT3
IO1
IO2
X OUT
X IN
RST
INT
GND
5.2V
OSCILLATOR
Q403 TC4069UBP
R414 4.7K
R415 39K
R416 4.7K
R417 39K
C412 0.022 (M)
C411 4700P (M)
R424 47K
R425 4.7K
R426 4.7K
Z402
47K x 4
D406
D407
D408
D409
D410
D406~D410 1S1555 x 5
R418 2.7K
R419 4.7K
W.401
Buzzer
L401 1mH
C413 220P
C414 180P
RAM
4.8V
R420 10K
Q405 TC5514P
A6 A5 A4 A3 A2 A1 A0 A7 A8 A9
IO1 IO2 IO3 IO4
CE
R/W
Q422
R421 82K
R422 33K
1.5V
1.1V
2SC1815-GR
Q406 TC4514BP
4-16 DECODER
STRB
INH
AIN
BIN
CIN
DIN
S0 S1 S2 S3 S4 S5 S6 S7 S8 S9 S10 S11 S12 S13 S14 S15
Q407 TC4508BP
Q408 TC4508BP
LATCH
CL CK DIS
IN1 IN2 IN3 IN4
Q1 Q2 Q3 Q4
a b k
j h m c
Dp d n p
r e g f
BUFFER
Q409 TC5066BP
Q410 TC5066BP
Q411 TC5066BP
Q412 TC5066BP
G1 a G2 b G3 k G4
j G5 h m G7 c G8
Dp G9 d G10 n p r
G13 e G14 g G15 f G16
Z403 47K x 9
Z404 47K x 6
Z405 47K x 7
Z406 47K x 9
N401 FIP 16A5R
F G1 a G2 b G3 k G4 j G5
h G6 m G7 c G8 Dp G9 d G10 n G11 p
G12 r G13 e G14 g G15 f G16 F
14 Segment 16 Column Display Tube
16
2
1
a b c d e f g h j k m n p r Dp
D411~D426
1S1555 x 16
D411 D412 D413 D414 D415 D416 D417 D418 D419 D420 D421 D422 D423 D424 D425 D426
Z Y X W V U T S R Q P
O N M L K J I H G F E D C B A
C B A 9 8 7 6 5 4 3 2 1 0
UP DOWN FM AM ST/M SCAN ST FQ CALL MEMO
RUBBER CONTACT Switch
E C B
2SC1815
TC4066UBP
TC5066BP
TC5514P
TC4508BP
TC4514BP
TMP4320AP-6501

Figure 17.

8. CABINET EXPLODED VIEW


312
314
310
312
334
334
T901
Switch P.C. Board
351
352
Power P.C. Board
312
339(TU)
EP01 (TE)
EP01 (TU)
J001 (TU)
314
313
319
318
314
327
320
314
312
324
326
325
321(TU)
353
314
S901
341
331
J001(TE)
L151
306
320
319
318
326
313
341
314
355
313
340
321(TE)
354
313
313
313
313
313
357
319
318
313
LED P.C. Board
356
328
313
319
313
328
318
314
357
314
313
Main P.C. Board
360
316
311
311
358
314
311
305
314
359
359
EP03
304
EP02
314
303
308
302
314
301
307
303
308
361
362
303

NOTE: Excluded parts in the Parts List are not available as replacement parts.

Figure 18.

9. PARTS LIST

CAUTION : The ⚠ mark, the symbol No. circled with rectangle in the schematic diagram and the shaded area in the parts list designate components which have special characteristics important for safety and should be replaced only with types identical to those in the original circuit or specified in the parts list.

Symbol No.	Part No.	Description
		CABINET PARTS
301	20017173	Froan Panel Ass'y
302	22701472	Screw, 2.6ϕ x 13mm, FLT
303	22705022	Plastic Rivet, 3ϕ x 5.5mm
304	25771776	Spring, Panel
305	20033147	Switch Cover, Panel
306	22824377	Knob, Power
307	22884112	Knob, Down/Up
308	22884113	Knob
310	20015259	Top Cover
311	22707751	Screw, 1.7ϕ x 6mm, PAN BLK
312	22707522	Screw, 3ϕ x 6mm, FLDT Chrome
313	22701237	Screw, 3ϕ x 6mm, BID Tapping
314	22701326	Screw, 3ϕ x 8mm, Tapping BLK
316	25776389	Spring, Panel
318	22701393	Screw, 3ϕ x 10mm, PAN
319	22828078	Foot
320	22707452	Screw, 3ϕ x 5mm, BID
321	20015269	Jack Plate (TE)
321	20015247	Jack Plate (TU)
324	22832575	Battery Box
325	22832576	Battery Cover
326	22707626	Screw, 2.6ϕ x 8mm, FLT BLK
⚠ 327	25845528	Cord Bush
328	22705020	Plastic Rivet, 3ϕ x 4.5mm
331	22707397	Screw, 2.6ϕ x 5mm, DTBID BLK
334	22701435	Screw, 3ϕ x 6mm, TPAN
339	22864253	Caution (TU)
340	22864459	Name Label (TE)
340	22864460	Name Label (TU)
341	22707066	Screw, 3ϕ x 6mm, FTBID BLK
		TRANSISTORS, IC'S & DIODES
Q101	22114700	IC, LA1231
Q102	22114470	IC, NJM4558D-A
Q103, 104		Transistor, 2SC1923-O
Q105		Transistor, 2SC1815NEW-GR
Q151	22114587	IC, HA1197
Q152		Transistor, 2SK30A-TM.O
Q201	22114837	IC, HA12016
Q401		IC, TD6104P
Q402		IC, TC9137P
Q403		IC, TC4069UBP
Q404	22114981	IC, TMP4320AP-6501
Q405		IC, TC5514P
Q406		IC, TC4514BP
Q407, 408		IC, TC4508BP
Q409, 410, 411, 412		IC, TC5066BP
Q413, 414, 415, 416, 417, 418, 419, 420, 421, 422		Transistor, 2SC1815NEW-GR
Q501		IC, TA7654P
Q502, 503, 504, 505, 506, 507		Transistor, 2SC1815NEW-GR
Q601		IC, TC4066BP
Q602, 603, 604, 605, 606, 607, 608, 609		Transistor, 2SC1815NEW-GR
Q901		Transistor, 2SC2120-Y/GR
Q902, 903		Transistor, 2SD880-Y-Y/GR
Q904		Transistor, 2SA950-Y
Q905		Transistor, 2SC2120-Y/GR
D101, 102		Diode, 1S1555V
D151	22115599	Diode, KV1226
D152	22115603	Diode, 1N60FD1
D401, 402, 403, 404, 405, 406, 407, 408, 409, 410, 411, 412, 413, 414, 415, 416, 417, 418, 419, 420, 421, 422, 423, 424, 425, 426		Diode, 1S1555V
D501, 502, 503, 504, 505, 506, 507, 508		Diode, TLG208, LED GRN
D509, 510		Diode, TLR208, LED RED
D511		Diode, TLG208, LED GRN
D512		Diode, TLR208, LED RED
D601, 602		Diode, 1S1555V

Symbol No.	Part No.	Description
D603		Diode, 1S1555V
⚠ D901, 902	22115427	Diode, MI-152
⚠ D903, 904		Diode, 1S1553V
⚠ D905		Diode, 1S1885
D906		Diode, 02Z24A
D907		Diode, 02Z13A
D908, 911		Diode, 02Z5.6A
D909		Diode, 05Z36
D910		Diode, 02Z6.2A
D912		Diode, 02Z5.1A
D913, 914, 915, 916		Diode, 1S1555V
COILS & TRANSFORMERS		
L001	22290013	Coil, Balun
L101, 102	22291082	Coil, 2.2μH
L103	22267385	IF Transformer, FM
L104	22153193	Filter, Low-pass
L151	22242824	Coil, AM Antenna
L152	22245365	Coil, AM Oscillator
L153	22264836	IF Transformer, AM
L154	22264744	IF Transformer, AM
L401	22232204	Coil, 1mH
⚠ T901	22224033	Transformer, Power (TE)
⚠ T901	22224034	Transformer, Power (TU)
ELECTRICAL PARTS		
J001	22162492	Terminal, Antenna (TE)
J001	22162463	Terminal, Antenna (TU)
J601	22163821	Jack, US2P
N401	22104563	Display Tube, FIP16A5R
⚠ S901	22195743	Switch, Push, Standby
W401	22152373	Buzzer, 3cm
Z001	22131370	FM Front End Block
Z101, 102, 103	22153124	Filter, Ceramic, 10.7MS
Z151	22153184	Filter, Ceramic, SFZ450GL
Z402	22540562	Composite Part, Resistor 47K ohm x 4P
Z403, 406	22540472	Composite Part, Resistor 47K ohm x 9P
Z404	22540473	Composite Part, Resistor 47K ohm x 6P
Z405	22540265	Composite Part, Resistor 47K ohm x 7P
Z407	22153141	Crystal, 7.2 MHz
Z601, 602	22135025	Filter, Low-Pass
EP01	22176286	Cord, Power E2ES (TE)
⚠ EP01	22176628	Cord, Power, BS2 (TU)
⚠ EP02	22751197	Rubber, Contact Switch
EP03	22192006	P.C. Board, Switch

Symbol No.	Part No.	Description
CAPACITORS D = ±0.5pF, J = ±5%, K = ±10%, M = ±20%, Z = –20+80% Abbreviations: CD = Ceramic Disk, EL = Electrolytic, MY = Mylar, PP = Polypropylene		
C101	22488478	EL, 0.47mfd, 50V
C102	22342223	CD, 0.022mfd, 50V, Z
C103	22342223	CD, 0.022mfd, 50V, Z
C104	22342473	CD, 0.047mfd, 50V, Z
C105	22342223	CD, 0.022mfd, 50V, Z
C106	22342223	CD, 0.022mfd, 50V, Z
C107	22342223	CD, 0.022mfd, 50V, Z
C108	22342473	CD, 0.047mfd, 50V, Z
C109	22342223	CD, 0.022mfd, 50V, Z
C110	22342473	CD, 0.047mfd, 50V, Z
C111	22488478	EL, 0.47mfd, 50V
C112	22488109	EL, 1mfd, 50V
C113	22342473	CD, 0.047mfd, 50V, Z
C114	22485101	EL, 100mfd, 16V
C115	22488109	EL, 1mfd, 50V
C116	22342473	CD, 0.047mfd, 50V, Z
C120	22485100	EL, 10mfd, 16V
C121	22362470	CD, 47P, 50V, K
C151	22342223	CD, 0.022mfd, 50V, Z
C152, 154	22309155	Trimmer, Max. 20pF x 2
C153	22342473	CD, 0.047mfd, 50V, Z
C155	22361509	CD, 5pF, 50V, D
C156	22342103	CD, 0.01mfd, 50V, Z
C157	22342103	CD, 0.01mfd, 50V, Z
C158	22361330	CD, 33pF, 50V, J
C159	22321054	PP, 560pF, 50V, J
C160	22342103	CD, 0.01mfd, 50V, Z
C161	22342473	CD, 0.047mfd, 50V, Z
C162	22349102	CD, 1000pF, 50V, K
C163	22485101	EL, 100mfd, 16V
C164	22362680	CD, 68pF, 50V, K
C165	22342103	CD, 0.01mfd, 50V, Z
C166	22342103	CD, 0.01mfd, 50V, Z
C167	22349102	CD, 1000pF, 50V, K
C168	22488339	EL, 3.3mfd, 50V
C169	22488479	EL, 4.7mfd, 50V
C170	22342103	CD, 0.01mfd, 50V, Z
C172	22488479	EL, 4.7mfd, 50V
C173	22485101	EL, 100mfd, 16V
C174	22485101	EL, 100mfd, 16V
C175	22485101	EL, 100mfd, 16V
C201	22485100	EL, 10mfd, 16V
C202	22485101	EL, 100mfd, 16V
C203, 204	22488229	EL, 2.2mfd, 50V
C205, 206	22321058	PP, 1200pF, 50V, J
C207, 208	22488109	EL, 1mfd, 50V
C209	22488339	EL, 3.3mfd, 50V
C210	22488109	EL, 1mfd, 50V

Symbol No.	Part No.	Description
C211	22488339	EL, 3.3mfd, 50V
C212	22488109	EL, 1mfd, 50V
C213	22321057	PP, 1000pF, 50V, J
C214	22371473	MY, 0.047mfd, 50V, J
C215	22342223	CD, 0.022mfd, 50V, Z
C401	22342223	CD, 0.022mfd, 50V, Z
C402	22342103	CD, 0.01mfd, 50V, Z
C403	22488109	EL, 1mfd, 50V
C404	22488478	EL, 0.47mfd, 50V
C405	22342103	CD, 0.01mfd, 50V, Z
C406	22485100	EL, 10mfd, 16V
C407	22485100	EL, 10mfd, 16V
C408	22488478	EL, 0.47mfd, 50V
C409, 410	22362470	CD, 47pF, 50V, K
C411	22371472	MY, 4700pF, 50V, J
C412	22371223	MY, 0.022mfd, 50V, J
C413	22321164	PP, 220pF, 50V, J
C414	22321084	PP, 180pF, 50V, J
C501	22485100	EL, 10mfd, 16V
C502	22485100	EL, 10mfd, 16V
C503	22342223	CD, 0.022mfd, 50V, Z
C504	22485470	EL, 47mfd, 16V
C601	22485470	EL, 47mfd, 16V
C603	22488479	EL, 4.7mfd, 50V
C604	22485101	EL, 100mfd, 16V
C605	22485100	EL, 10mfd, 16V
C606	22488109	EL, 1mfd, 50V
C607	22488109	EL, 1mfd, 50V
C608	22488479	EL, 4.7mfd, 50V
C609	22488479	EL, 4.7mfd, 50V
C610	22349391	CD, 390pF, 50V, K
C611	22349391	CD, 390pF, 50V, K
⚠ C901	22486221	EL, 220mfd, 25V
⚠ C902	22440110	EL, 220mfd, 80V
C903	22488101	EL, 100mfd, 50V
C904	22488100	EL, 10mfd, 50V
⚠ C905	22487471	EL, 470mfd, 35V
C906	22486101	EL, 100mfd, 25V
C907	22485100	EL, 10mfd, 16V
⚠ C908	22486471	EL, 470mfd, 25V
C909	22485101	EL, 100mfd, 16V
C910	22485100	EL, 10mfd, 16V
⚠ C911	22440110	EL, 220mfd, 80V
C912	22488101	EL, 100mfd, 50V
C913	22488100	EL, 10mfd, 50V
C914	22485101	EL, 100mfd, 16V
C915	22485100	EL, 10mfd, 16V
C916	22483221	EL, 220mfd, 10V
C917	22485100	EL, 10mfd, 16V
C918	22482222	EL, 2200mfd, 6.3V
C919	22482222	EL, 2200mfd, 6.3V
C920	22485101	EL, 100mfd, 16V

Symbol No.	Part No.	Description
RESISTORS All resistors are carbon film ¼W, ±5% unless otherwise noted. K = 1000, M = 1000000		
R101	22545102	1K ohm
R102	22545151	150 ohm
R103	22545331	330 ohm
R104	22545221	220 ohm
R105	22545562	5.6K ohm
R106	22545471	470 ohm
R107	22545331	330 ohm
R108	22545331	330 ohm
R109	22545221	220 ohm
R110	22545562	5.6K ohm
R111	22545471	470 ohm
R112	22545331	330 ohm
R113	22545154	150K ohm
R114	22545331	330 ohm
R115	22545123	12K ohm
R116	22545153	15K ohm
R117	22545152	1.5K ohm
R118	22545103	10K ohm
R119	22545822	8.2K ohm
R120	22545473	47K ohm
R121	22545222	2.2K ohm
R122	22545473	47K ohm
R123	22545563	56K ohm
R124	22545683	68K ohm
R125	22545105	1M ohm
R126	22545683	68K ohm
R127	22545105	1M ohm
R128	22545104	100K ohm
R129	22658495	100K ohm, Semi-fixed Variable
R151	22545102	1K ohm
R152	22545224	220K ohm
R153	22545224	220K ohm
R154	22545331	330 ohm
R155	22545470	47 ohm
R156	22545104	100K ohm
R157	22545101	100 ohm
R158	22545151	150 ohm
R159	22545332	3.3K ohm
R160	22545151	150 ohm
R161	22545221	220 ohm
R162	22545103	10K ohm
R163	22545103	10K ohm
R164	22545152	1.5K ohm
R165	22545103	10K ohm
R166	22545682	6.8K ohm
R201	22547101	100 ohm, ½W
R202	22545222	2.2K ohm

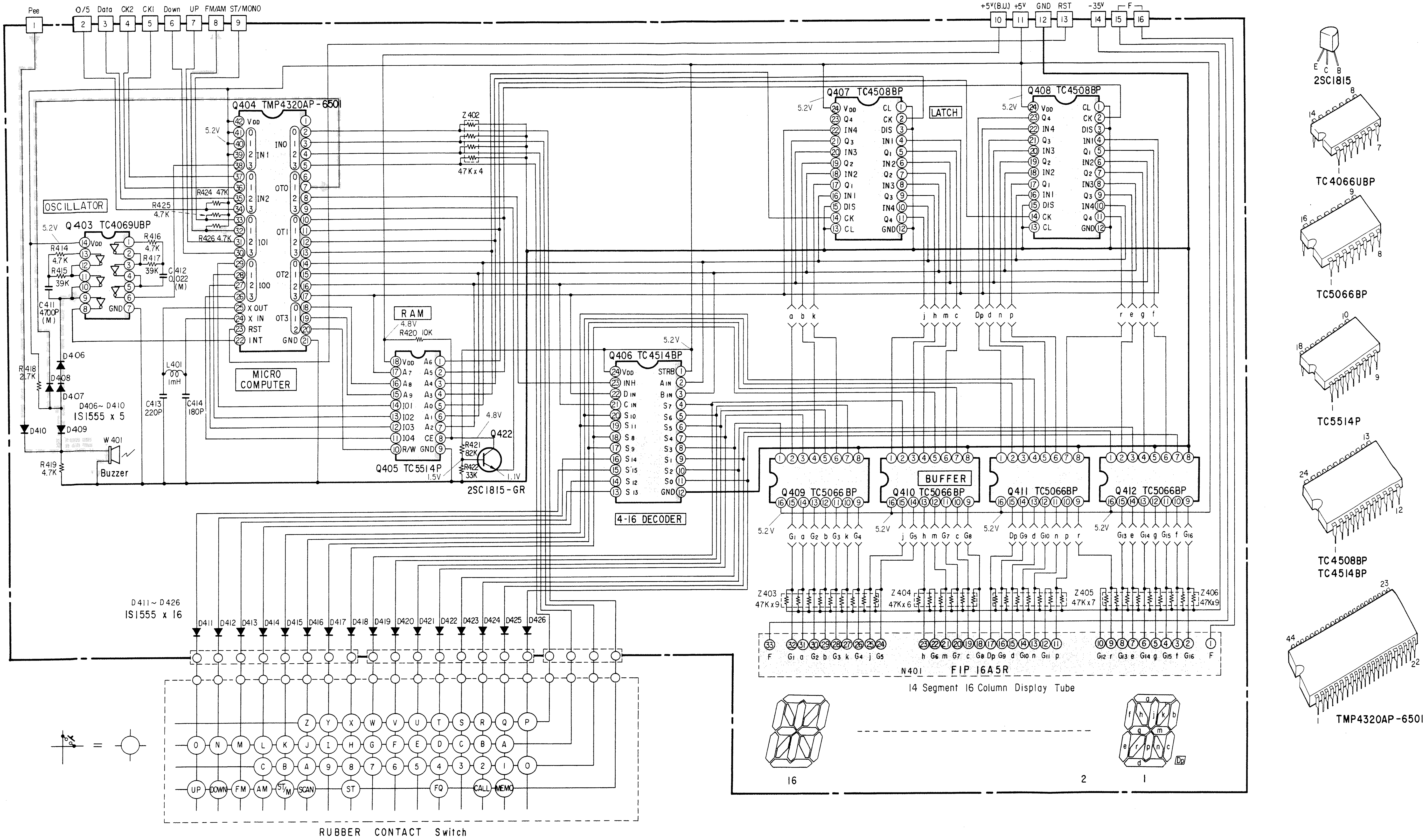

Pee
O/5
Data
CK2
CK1
Down
UP
FM/AM
ST/MONO
+5V(B.U)
+5V
GND
RST
-35V
F
Q404 TMP4320AP-6501
MICRO COMPUTER
OSCILLATOR
Q403 TC4069UBP
R414 4.7K
R415 39K
R416 4.7K
R417 39K
C412 0.022 (M)
C411 4700P (M)
R424 47K
R425 4.7K
R426 4.7K
Z402 47Kx4
RAM
R420 10K
4.8V
Q405 TC5514P
R421 82K
R422 33K
Q422
2SC1815-GR
L401 1mH
C413 220P
C414 180P
D406
D407
D408
D406~D410 1S1555 x 5
D409
D410
R418 2.7K
R419 4.7K
W401
Buzzer
Q406 TC4514BP
4-16 DECODER
Q407 TC4508BP
Q408 TC4508BP
LATCH
Q409 TC5066BP
Q410 TC5066BP
Q411 TC5066BP
Q412 TC5066BP
BUFFER
Z403 47Kx9
Z404 47Kx6
Z405 47Kx7
Z406 47Kx9
N401 FIP 16A5R
14 Segment 16 Column Display Tube
16
2
1
D411~D426 1S1555 x 16
RUBBER CONTACT Switch
UP
DOWN
FM
AM
ST/M
SCAN
ST
FQ
CALL
MEMO
2SC1815
E C B
TC4066UBP
TC5066BP
TC5514P
TC4508BP
TC4514BP
TMP4320AP-6501

Figure 32.

175

SERVICE TEXT
FILE NO.176-139

TOSHIBA
DIGITAL SYNTHESIZER TUNER
ST-S80

SUBJECT: DIGITAL SYNTHESIZER TUNER BASIC EXPLANATION

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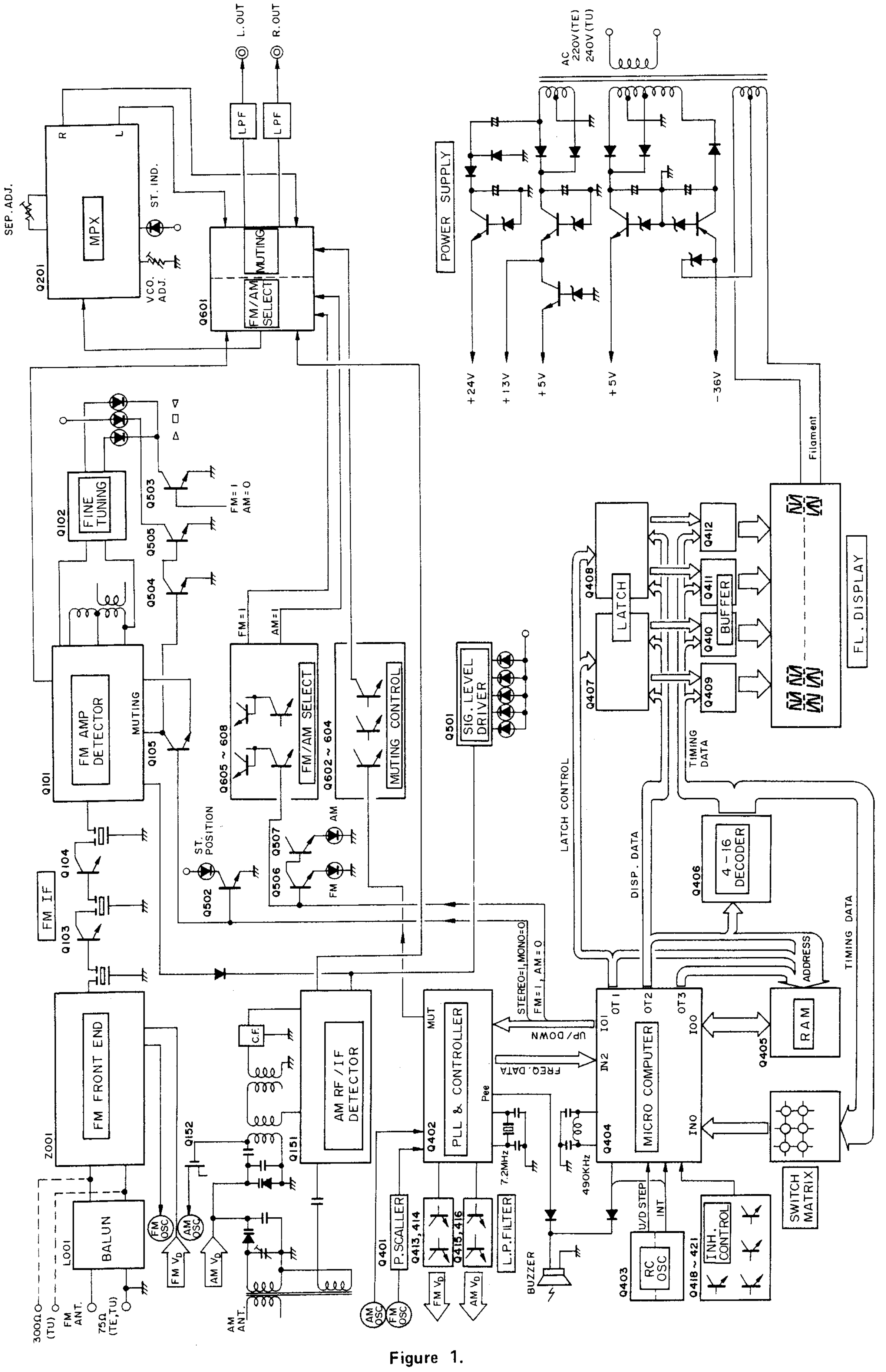
BLOCK DIAGRAM



L. OUT
R. OUT
LPF
LPF
AC 220V (TE) 240V (TU)
POWER SUPPLY
+24V
+13V
+5V
+5V
-36V
Filament
SEP. ADJ.
Q201
MPX
R
L
ST. IND.
VCO. ADJ.
Q601
FM/AM SELECT
MUTING
Q102
FINE TUNING
Q503
Q505
Q504
FM=1
AM=0
Q101
FM AMP DETECTOR
MUTING
Q105
FM=1
AM=1
Q605 ~ 608
FM/AM SELECT
Q602 ~ 604
MUTING CONTROL
Q501
SIG. LEVEL DRIVER
Q408
Q407
LATCH
Q412
Q411
Q410
Q409
BUFFER
FL. DISPLAY
TIMING DATA
LATCH CONTROL
DISP. DATA
Q406
4-16 DECODER
TIMING DATA
ADDRESS
FM IF
Q104
Q103
ST. POSITION
Q502
Q507
Q506
AM
FM
STEREO=1, MONO=0
FM=1, AM=0
UP/DOWN
FREQ. DATA
Z001
FM FRONT END
Q152
Q151
C.F.
AM RF/IF DETECTOR
Q402
PLL & CONTROLLER
MUT
Pee
7.2MHz
L.P. FILTER
Q404
MICRO COMPUTER
OT1
OT2
OT3
IO1
IN2
IO0
INO
490KHz
Q405
RAM
SWITCH MATRIX
L001
BALUN
300Ω (TU)
FM ANT.
75Ω (TE, TU)
FM OSC
AM OSC
FM V_D
AM V_D
AM ANT.
Q401
P. SCALLER
Q413, 414
Q415, 416
AM OSC
FM OSC
FM V_D
AM V_D
BUZZER
U/D STEP
INT
Q403
RC OSC
Q418 ~ 421
INH. CONTROL

Figure 1.

ST-S80 TUNING SYSTEM

The Tuning System employed for the ST-S80 involving Synthesizer Tuner displaying "Station Name – Station Calling and Station Name Display is coordinated, the basic movements of which are explained herebelow.

1. Construction

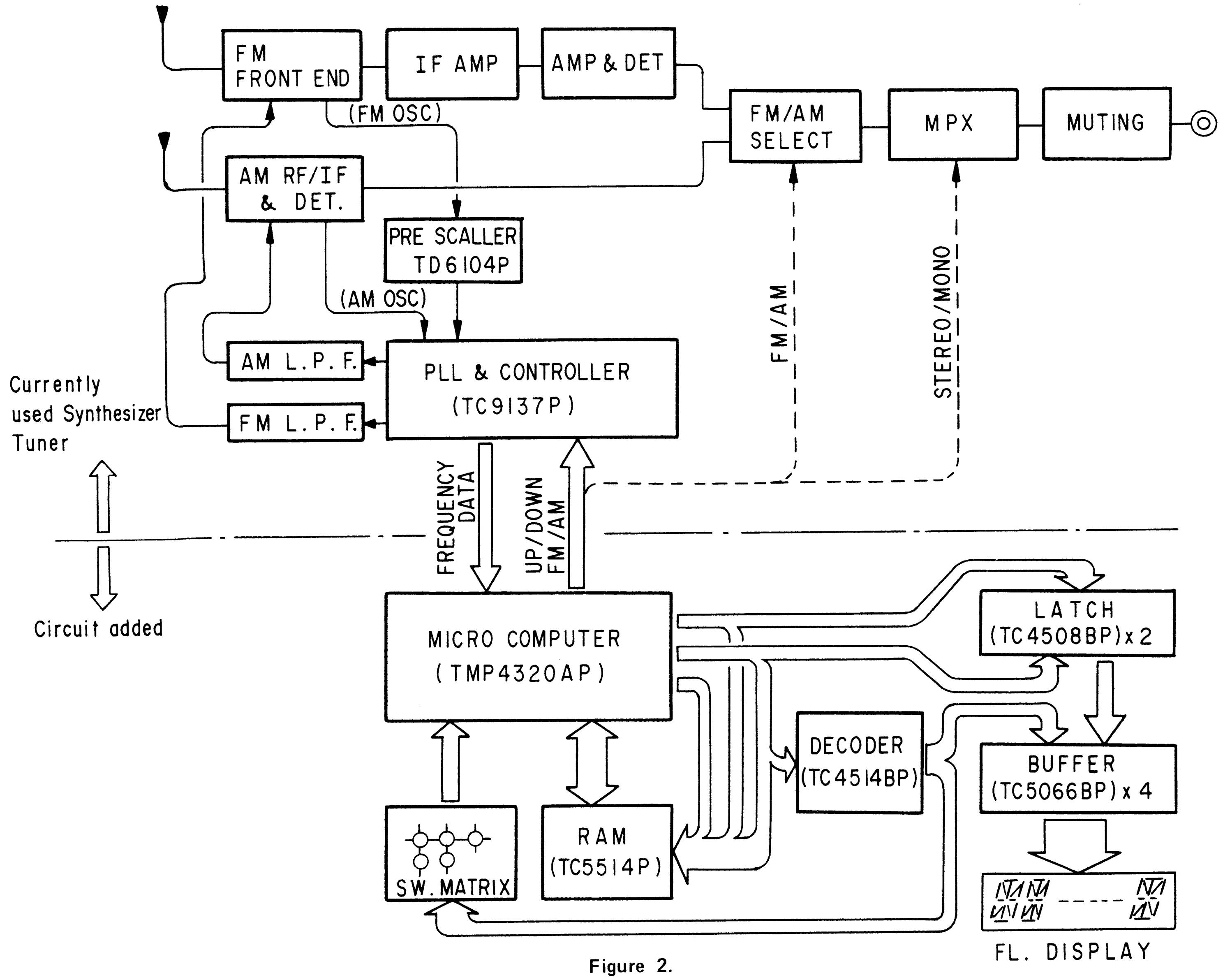


Figure 2.

- * Figure 2 shows the basic construction of the ST-S80.
- * Above the dotted line ——— - ——————— - ——— in the Figure, construction is identical with that of the Synthesizer Tuner in current use so that explanations thereof can herewith be omitted. (Note 1)
- * Below the dotted line ——— - ——————— - ——— in the Figure is shown the newly added Circuit to the ST-S80.
- * Data exchanges between TC9137P (Controller) total 8 bits, namely, 4 bits for Frequency Data and 4 bits for data concerning Up/Down, FM/AM, Stereo/Mono.
- * TMP4320AP (Micro Computer) is the core of all the various movements of the ST-S80 and works to distinguish and discriminate Key Input, Display Data Output, I/O Data of the outside attached RAM (TC5514P) and to effect control of the Controller (TC9137P).

- * The outside attached RAM (TC5514P) is a memory with a capacity of 4 x 1024 bits within which can be memorized Frequency Data, Station Data, FM/AM Band Data etc., totalling the needs of 30 stations.
- * The Decoder (TC4514BP), Latch (TC4508BP) and Buffer (TC5066BP) mainly form an interface circuit for the purpose of transmitting station name, frequency display data.
- * For display, a 14 segment, 16 digit fluorescent display tube is employed and dynamic lighting is the method of illumination.
- * The Key Input Device utilizes a 16 x 4 Matrix Type Key Switch employing throughout electric conductive rubber whereby the input of all signals (Up/Down, Band Switching, Memory Channel Calls, Letter and Figure Input, Memory etc.) is possible.

(Note 1) Please refer to ST-S70 SERVICE TEXT (No.176 – 114) for details in respect to this portion.

Herebelow, explanations are given, in order of sequence, covering the basic movements of the ST-S80 which principally relate to data movements with the micro-computer as the core. (Note)
No mention is made of movements of FM.AM linear circuit here.

2. Basic Movements

The hereinbelow described three (3) movements provide a broad classification of the movements of the ST-S80 with the Micro-Computer TMP4320AP-6501 as the center.

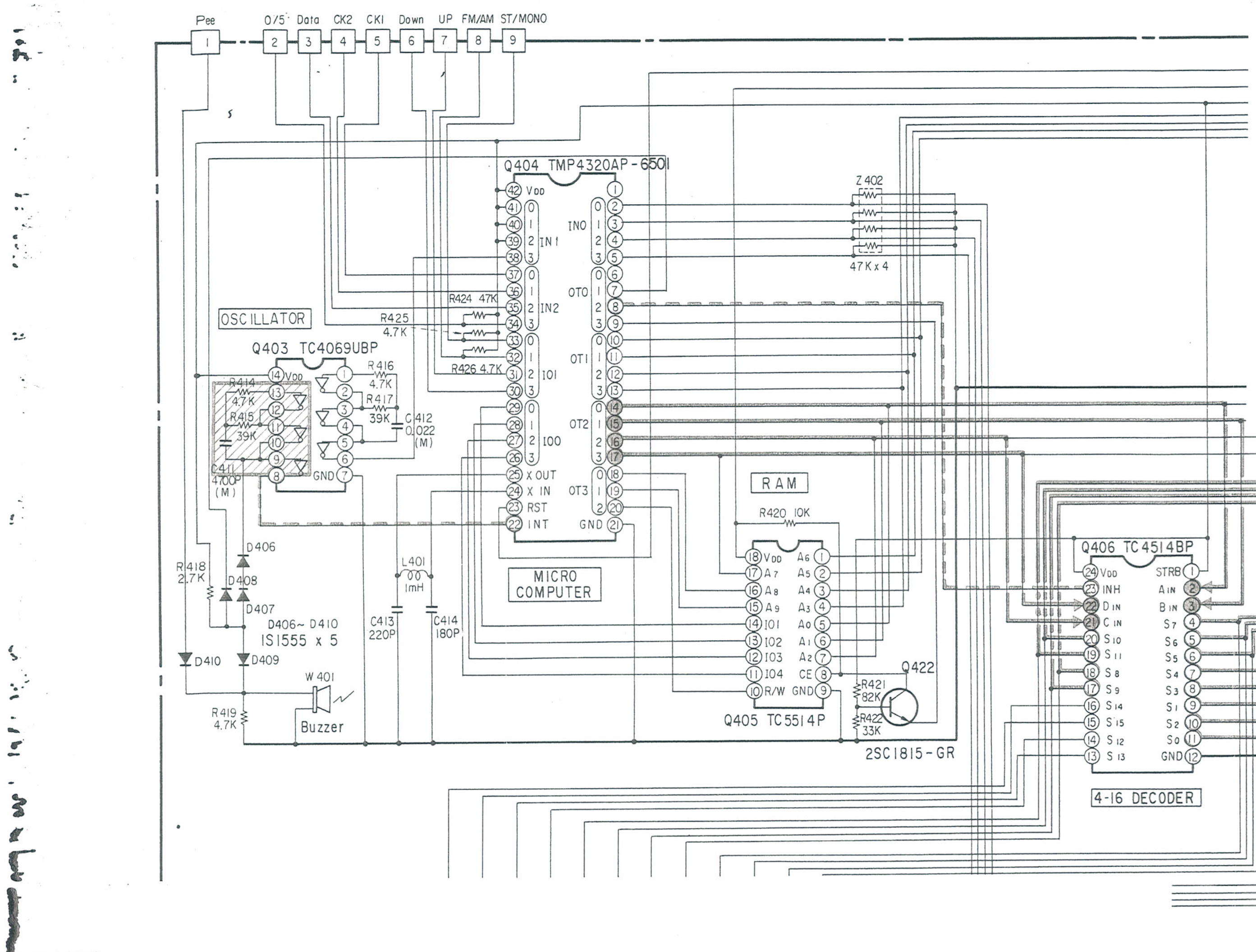
- ■ When receiving certain fixed broadcasting stations. (Dispaly Data Movements).
- ■ When calling other broadcasting stations.
  - (1) STATION CALL
  - (2) FREQUENCY CALL
  - (3) PRESET (MEMORY) CHANNEL CALL
  - (4) MANUAL UP/DOWN CALL
  - (5) AUTO (MEMORY) CHANNEL SCAN CALL
- ■ When memorizing broadcasting stations.

- * When receiving a certain broadcasting station (fixed normal situation), no data exchanges between the Micro Computer TMP4320AP and the Controller TC9137P occur. Display Data Output alone from the Micro Computer for purpose of display takes place. (Please refer to Paragraph 3 – Display Data Movements for details).
- * When calling a station that currently is being received as well as another station, data exchanges between TMP4320AP and TC9137P and with RAM TC5514P does occur, at which time no output of Display Data takes place. (Please refer to Paragraph 4 – Call Movements for details).
- * When memorizing broadcasting stations (frequency, broadcasting station name), movements primarily take the form of data exchanges between TMP4320AP and TC5514P and when frequency transfers accompany such exchanges, the abovementioned call movements are added. (Please refer to Paragraph 5 – Memory Movements for details).
- * While data movements under the various movements are absolutely different, one from another, each data line that is used in common are large in number (refer to Circuit Diagram, Block Diagram) and require due care and attention.

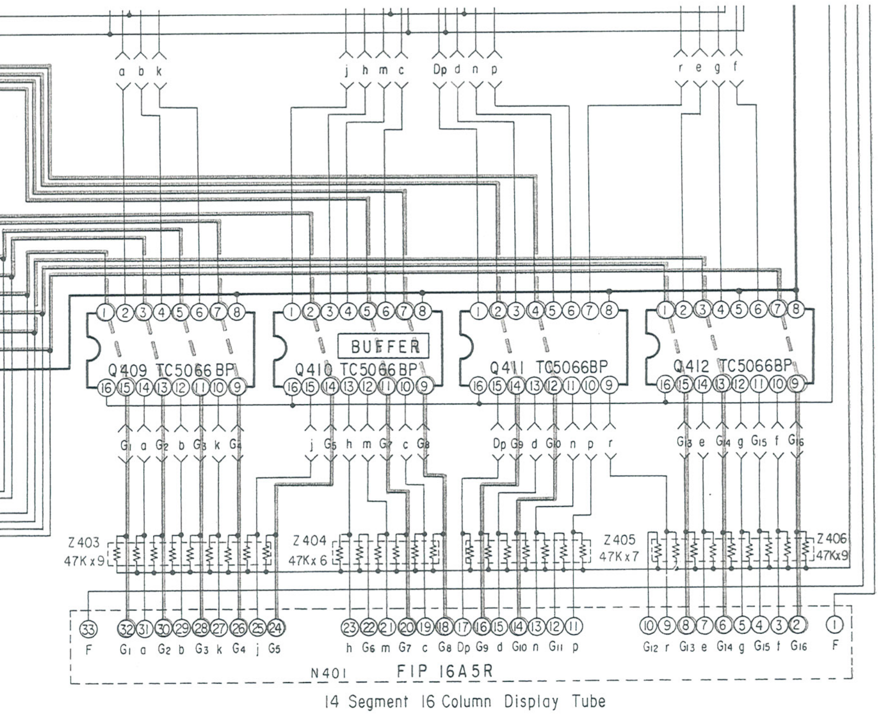
Next, individual explanations of the details covering the abovementioned three (3) movements are provided hereunder –

(Note) Regarding Linear Circuit Movements, refer to ST-S70 SERVICE TEXT (No.176-114).

The flow of Timing Data is shown.

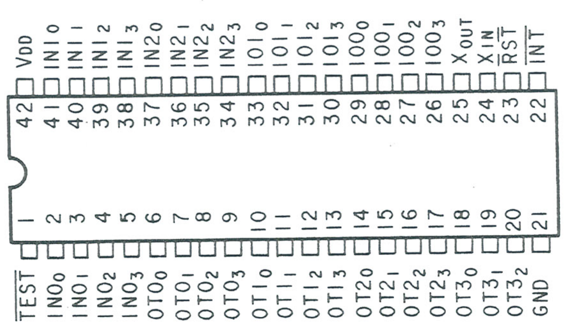


Pee
0/5
Data
CK2
CK1
Down
UP
FM/AM
ST/MONO
Q404 TMP4320AP-6501
MICRO COMPUTER
OSCILLATOR
Q403 TC4069UBP
RAM
R420 10K
Q405 TC5514P
Q422
2SC1815-GR
Z402
47K x 4
R418 2.7K
R419 4.7K
D406~D410
1S1555 x 5
L401
C413 220P
C414 180P
W401
Buzzer
Q406 TC4514BP
4-16 DECODER
Q409 TC5066BP
Q410 TC5066BP
BUFFER
Q411 TC5066BP
Q412 TC5066BP
Z403 47Kx9
Z404 47Kx6
Z405 47Kx7
Z406 47Kx9



N401 FIP 16A5R
14 Segment 16 Column Display Tube

TMP4320 AP-6501

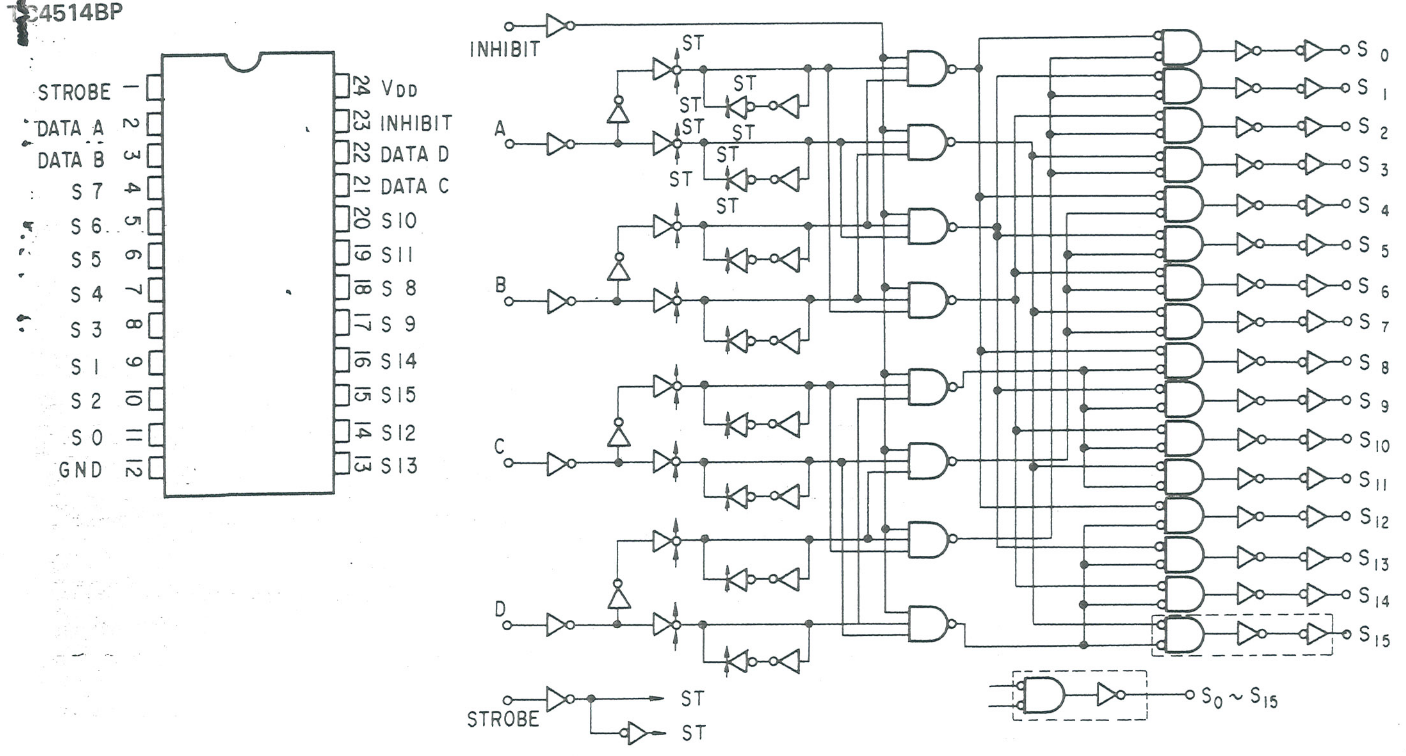


VDD
IN1$_0$
IN1$_1$
IN1$_2$
IN1$_3$
IN2$_0$
IN2$_1$
IN2$_2$
IN2$_3$
IO1$_0$
IO1$_1$
IO1$_2$
IO1$_3$
IO0$_0$
IO0$_1$
IO0$_2$
IO0$_3$
X$_{OUT}$
X$_{IN}$
$\overline{RST}$
$\overline{INT}$
$\overline{TEST}$
IN0$_0$
IN0$_1$
IN0$_2$
IN0$_3$
OT0$_0$
OT0$_1$
OT0$_2$
OT0$_3$
OT1$_0$
OT1$_1$
OT1$_2$
OT1$_3$
OT2$_0$
OT2$_1$
OT2$_2$
OT2$_3$
OT3$_0$
OT3$_1$
OT3$_2$
GND

PIN NAME/FUNCTION

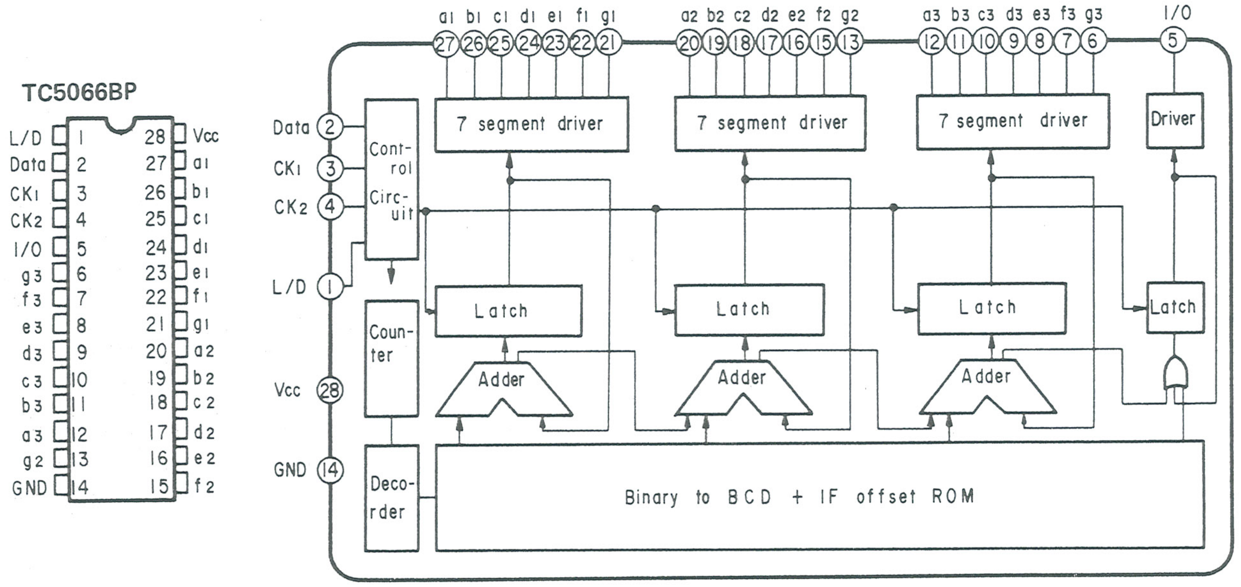
Pin	Input/Output	Function
IN0$_0$~IN0$_3$	Input	Input Port IN0
IN1$_0$~IN1$_3$	Input	Input Port IN1
IN2$_0$~IN2$_3$	Input	Input Port IN2
OT0$_0$~OT0$_3$	Output	Output Port OT0
OT1$_0$~OT1$_3$	Output	Output Port OT1
OT2$_0$~OT2$_3$	Output	Output Port OT2
OT3$_0$~OT3$_2$	Output	Output Port OT3
IO0$_0$~IO0$_3$	Input/Output	Input/Output Port IO0
IO1$_0$~IO1$_3$	Input/Output	Input/Output Port IO1
$\overline{RST}$	Input	Initialize Signal Input
$\overline{INT}$	Input	Offering Signal Input
X$_{IN}$	Input	Basic Clock Terminal
X$_{OUT}$	Output	Basic Clock Terminal
$\overline{TEST}$	Input	LSI Test Input
V$_{DD}$		5V (Power Source)
GND		0V (Power Source)

TC4514BP



STROBE
DATA A
DATA B
S 7
S 6
S 5
S 4
S 3
S 1
S 2
S 0
GND
VDD
INHIBIT
DATA D
DATA C
S 10
S 11
S 8
S 9
S 14
S 15
S 12
S 13
INHIBIT
A
B
C
D
STROBE
ST
S$_0$~S$_{15}$

TC5066BP



L/D
Data
CK1
CK2
I/O
Vcc
GND
7 segment driver
Driver
Control Circuit
Counter
Decorder
Latch
Adder
Binary to BCD + IF offset ROM

Figure 3.

3. Display Data Movements

3-1 Timing Data

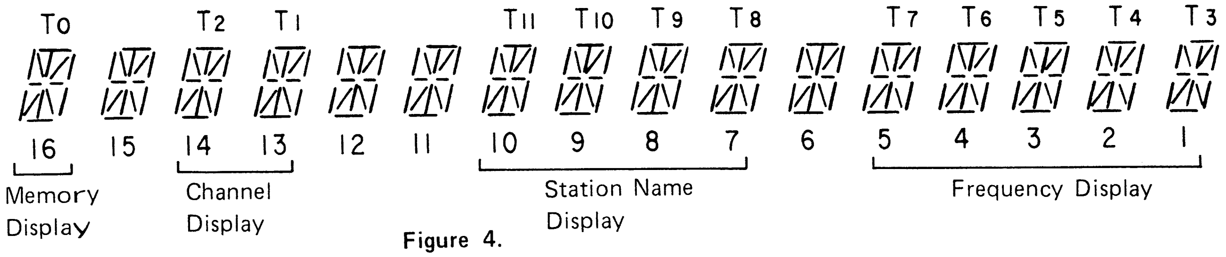

To
T2
T1
T11
T10
T9
T8
T7
T6
T5
T4
T3
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
Memory Display
Channel Display
Station Name Display
Frequency Display

Figure 4.

* The ST-S80, as shown in Figure 4, utilizes a 14-segment (+ Decimal Point) 16-digit fluorescent display tube.
* Display is as per the undermentioned four categories with the number of display digits totalling 12 —
    (1) Frequency Display (1 ~ 5 digits)
    (2) Station Name Display (7 ~ 10 digits)
    (3) Channel Display (13 ~ 14 digits)
    (4) Memory Display (16 digits)
* The 12-digit display (lettering and figures) are lit up by a dynamic illumination method. The dynamic illumination order of sequence is as above the segment of Figure 4 ($T_0 - T_{11}$). (Note)
* In Figure 3, the flow of Timing Data is shown.
* Data is transmitted in the following order —

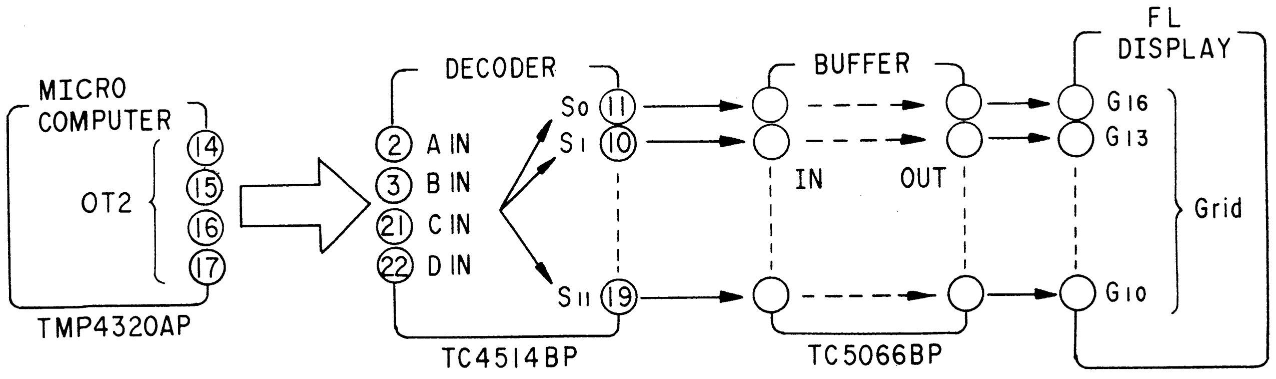

MICRO COMPUTER
OT2
⑭
⑮
⑯
⑰
TMP4320AP
DECODER
② A IN
③ B IN
㉑ C IN
㉒ D IN
S0 ⑪
S1 ⑩
S11 ⑲
TC4514BP
BUFFER
IN
OUT
TC5066BP
FL DISPLAY
G16
G13
G10
Grid

Figure 5.

* In Figure 6 is shown the Timing Chart, the output from TMP4320AP OT2 port.
* Timing Data is repeatedly output from OT2 port per BCD Code 0.1.2 ..... 9, A.B — — — up to E.F., of which O — B (T_0 ~ T_{11}) are used for the purpose of FL Display while that between T_{12} ~ T_{15} are left blank.
* The illumination of the Display Tube during one (1) Timing (T_0 ~ T_{11}) occurs only in the latter half with use in the first half confined to transmission of segment data. (The slanted lines in the Figure).

(Note) While Timings T_{12}, T_{13}, T_{14}, T_{15} also are generated, they do not participate in the illumination.

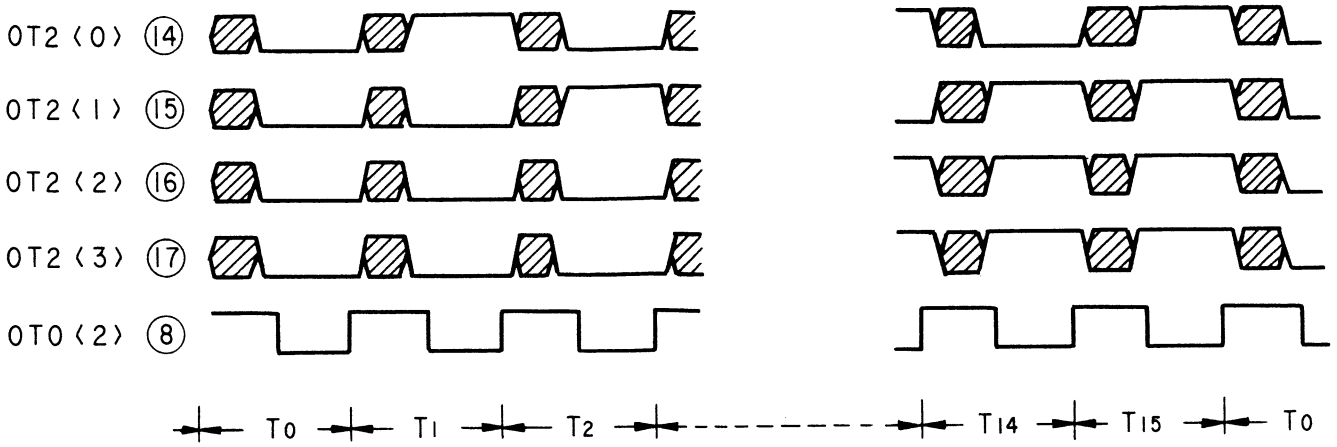
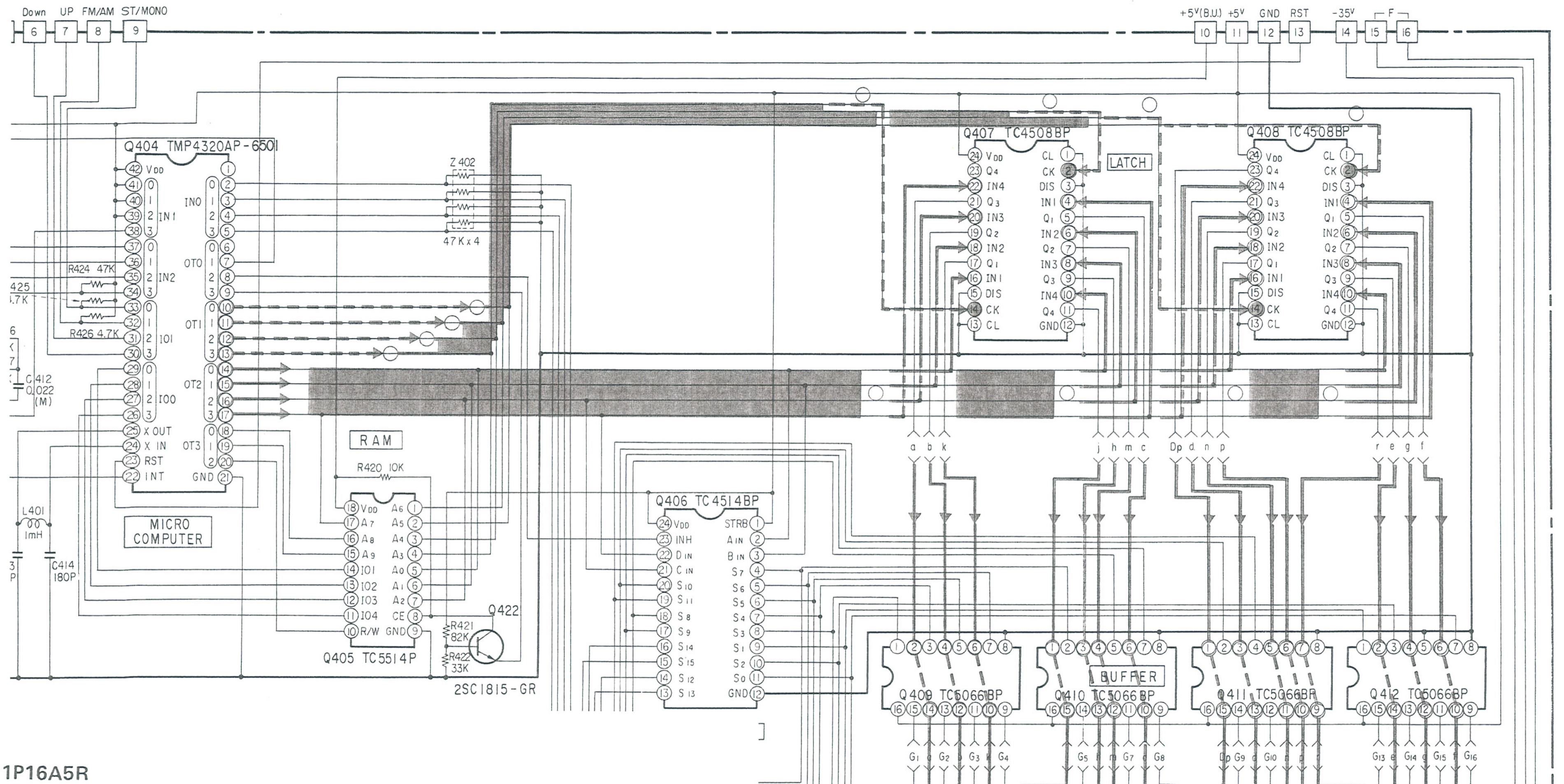

OT2 (0) ⑭
OT2 (1) ⑮
OT2 (2) ⑯
OT2 (3) ⑰
OTO (2) ⑧
To
T1
T2
T14
T15
To

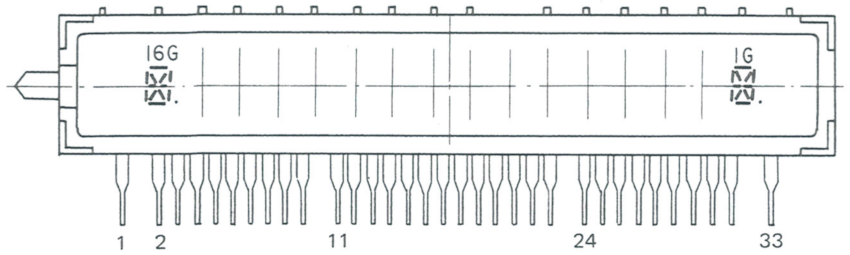
Figure 6.

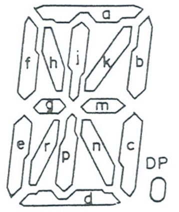
* Controlling output (S_0 ~ S_{15}) from the Decoder TC4514BP is effected by INHIBIT Terminal(㉕ Pin) and this Control Signal outputs from OTO (2)(⑧Pin) of the Micro-Computer.
* Cycle of Timing Data is —
  $T_0 = T_1 = - - - - - - = T_{15}$ = 0.5 msec.
  This cycle is controlled by the Micro-Computer INTERRUPT Input(㉒ Pin).

Signal Transmission Channel is shown.


Down UP FM/AM ST/MONO
6 7 8 9
+5V(B.U) +5V GND RST -35V F
10 11 12 13 14 15 16
Q404 TMP4320AP-6501
MICRO COMPUTER
Z402
47K x 4
R424 47K
R426 4.7K
C412 0.022 (M)
L401 1mH
C414 180P
RAM
R420 10K
Q405 TC5514P
Q422
R421 82K
R422 33K
2SC1815-GR
Q406 TC4514BP
Q407 TC4508BP
LATCH
Q408 TC4508BP
BUFFER
Q409 TC5066BP
Q410 TC5066BP
Q411 TC5066BP
Q412 TC5066BP
Z403 47K x 9
Z404 47K x 6
Z405 47K x 7
Z406 47K x 9
N401 FIP16A5R
14 Segment 16 Column Display Tube
16
2
1

F1P16A5R

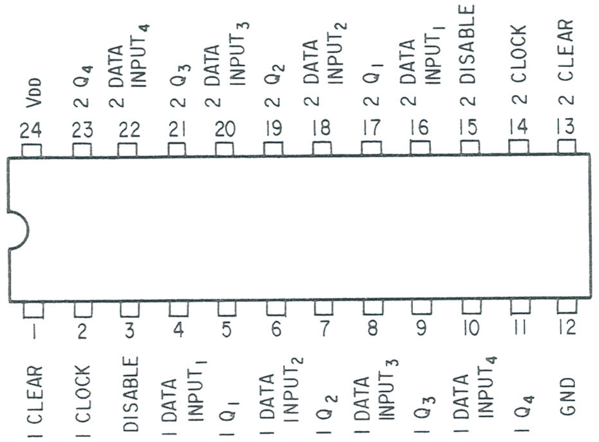

16G
1G
1
2
11
24
33


a
f
h
i
k
b
g
m
e
r
p
n
c
d
DP

DISPLAY PATTERN

TC4508BP

PIN CONNECTION DIAGRAM

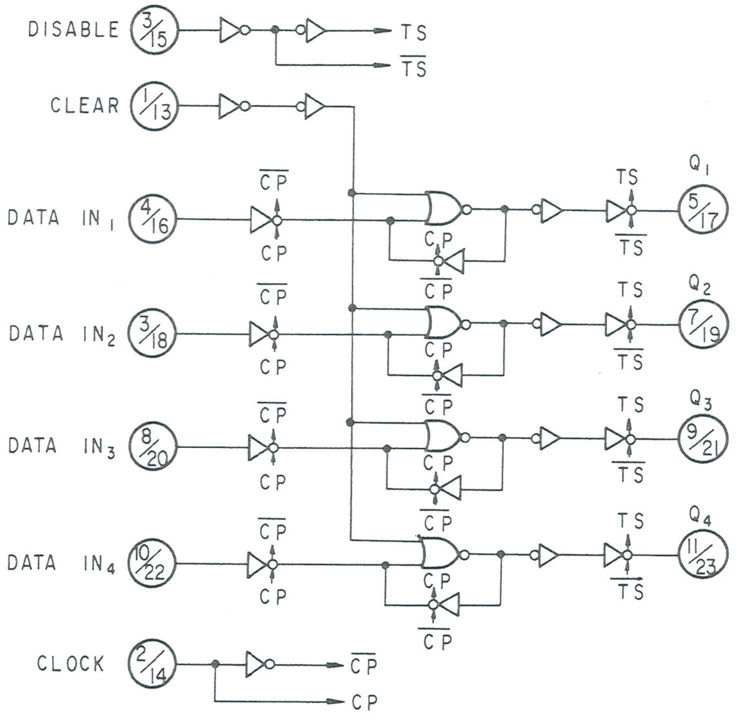

24 VDD
23 2 Q4
22 2 DATA INPUT4
21 2 Q3
20 2 DATA INPUT3
19 2 Q2
18 2 DATA INPUT2
17 2 Q1
16 2 DATA INPUT1
15 2 DISABLE
14 2 CLOCK
13 2 CLEAR
1 1 CLEAR
2 1 CLOCK
3 1 DISABLE
4 1 DATA INPUT1
5 1 Q1
6 1 DATA INPUT2
7 1 Q2
8 1 DATA INPUT3
9 1 Q3
10 1 DATA INPUT4
11 1 Q4
12 GND

TRUTH TABLE

CLEAR	CLOCK	DISABLE	DATA INPUTS				OUTPUTS			
			D_1	D_2	D_3	D_4	Q_1	Q_2	Q_3	Q_4
*	*	H	*	*	*	*	HZ			
H	*	L	*	*	*	*	L	L	L	L
L	L	L	*	*	*	*	LATCHED			
L	H	L	A	B	C	D	A	B	C	D

*; Don't Care
HZ; High Impedance

LOGIC DIAGRAM


DISABLE 3/15
TS
TS
CLEAR 1/13
DATA IN1 4/16
DATA IN2 3/18
DATA IN3 8/20
DATA IN4 10/22
CP
Q1 5/17
Q2 7/19
Q3 9/21
Q4 11/23
CLOCK 2/14

ELECTRODE CONNECTION

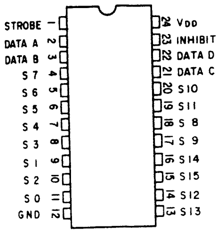
Terminal No.	1	2	3	4	5	6	7	8	9	10	11
Electrode Connected	F	16G	P(f)	15G	P(g)	14G	P(e)	13G	P(r)	12G	P(p)
Terminal No.	12	13	14	15	16	17	18	19	20	21	22
Electrode Connected	11G	P(n)	10G	P(d)	9G	P(DP)	8G	P(c)	7G	P(m)	6G
Terminal No.	23	24	25	26	27	28	29	30	31	32	33
Electrode Connected	P(h)	5G	P(j)	4G	P(k)	3G	P(b)	2G	P(a)	1G	F

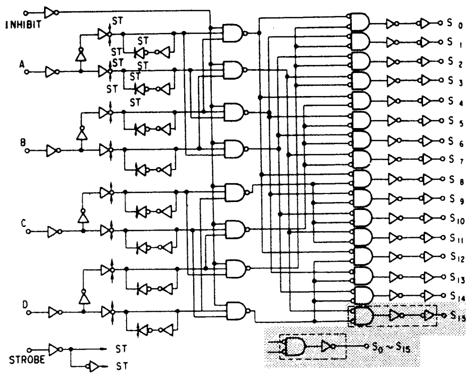
Figure 7.

Error

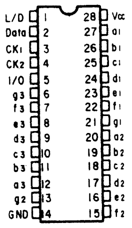
Page 5

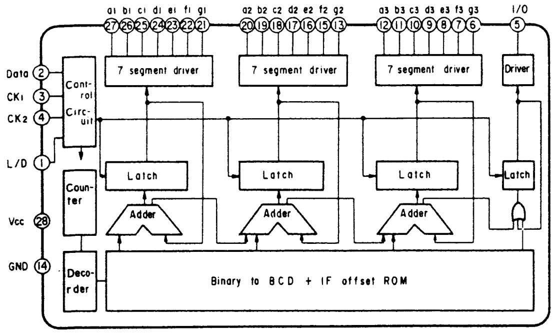
TC4514BP


STROBE 1
DATA A 2
DATA B 3
S 7 4
S 6 5
S 5 6
S 4 7
S 3 8
S 1 9
S 2 10
S 0 11
GND 12
24 VDD
23 INHIBIT
22 DATA D
21 DATA C
20 S10
19 S11
18 S 8
17 S 9
16 S14
15 S15
14 S12
13 S13


INHIBIT
A
B
C
D
STROBE
ST
S0 ~ S15

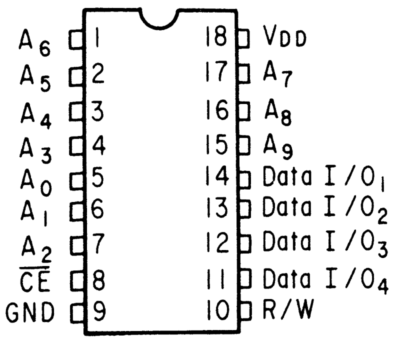
TC5066BP


L/D 1
Data 2
CK1 3
CK2 4
I/O 5
g3 6
f3 7
e3 8
d3 9
c3 10
b3 11
a3 12
g2 13
GND 14
28 Vcc
27 a1
26 b1
25 c1
24 d1
23 e1
22 f1
21 g1
20 a2
19 b2
18 c2
17 d2
16 e2
15 f2


Data
CK1
CK2
L/D
Vcc
GND
7 segment driver
Driver
Control Circuit
Counter
Decorder
Latch
Adder
Binary to BCD + IF offset ROM
I/O

Page 13

TC5514P


A6 1
A5 2
A4 3
A3 4
A0 5
A1 6
A2 7
CE 8
GND 9
18 VDD
17 A7
16 A8
15 A9
14 Data I/O1
13 Data I/O2
12 Data I/O3
11 Data I/O4
10 R/W

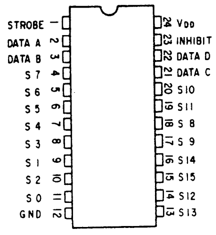
PIN NAME

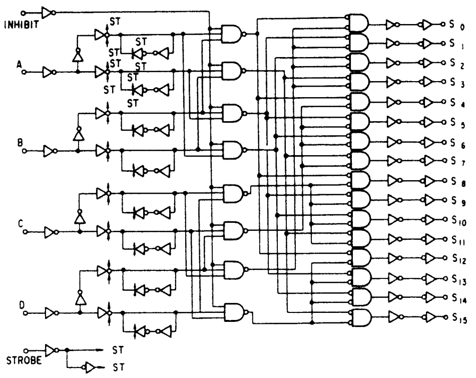
$A_0 \sim A_9$	Address Input
R / W	Lead Light Input
CE	Tip Enable Input
Data I/O$_{1\sim4}$	Data Input Output
V_{DD}/GND	Power Source

Correct

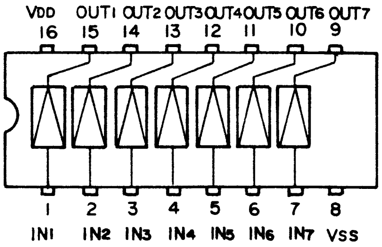
Page 5

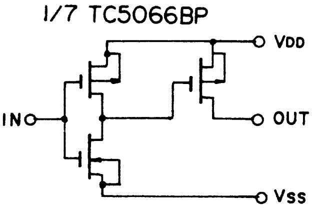
TC4514BP


STROBE 1
DATA A 2
DATA B 3
S 7 4
S 6 5
S 5 6
S 4 7
S 3 8
S 1 9
S 2 10
S 0 11
GND 12
24 VDD
23 INHIBIT
22 DATA D
21 DATA C
20 S10
19 S11
18 S 8
17 S 9
16 S14
15 S15
14 S12
13 S13


INHIBIT
A
B
C
D
STROBE
ST

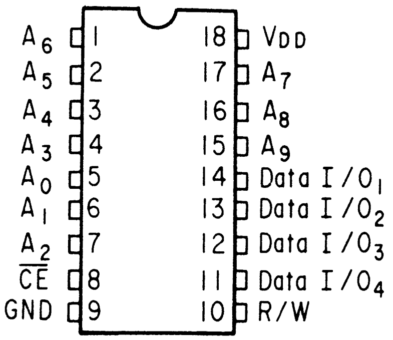
TC5066BP


VDD 16
OUT1 15
OUT2 14
OUT3 13
OUT4 12
OUT5 11
OUT6 10
OUT7 9
1 IN1
2 IN2
3 IN3
4 IN4
5 IN5
6 IN6
7 IN7
8 VSS


1/7 TC5066BP
VDD
IN
OUT
Vss

Page 13

TC5514P


A6 1
A5 2
A4 3
A3 4
A0 5
A1 6
A2 7
CE 8
GND 9
18 VDD
17 A7
16 A8
15 A9
14 Data I/O1
13 Data I/O2
12 Data I/O3
11 Data I/O4
10 R/W

PIN NAME

$A_0 \sim A_9$	Address Input
R / W	Read/Write Input
CE	Chip Enable Input
Data I/O$_{1\sim4}$	Data Input Output
V_{DD}/GND	Power Source

3-2 Segment Data

- * Output from the Micro-Computer TMP4320AP is the same as for the Timing Data, namely, from OT2 port.
- * Signal Transmission Channel is shown in Figure 7.
- * While the Display Tube consists of several 14-segment (+ 1 Decimal Point) digits, the Transmission Line has four (4) bits so that a 4-time series transmission method is adopted for the transmission of this 15 bit data.
- * This 4-time per 4-bit data transmission is received by a 4-piece Latch Circuit (TC4508BPx2) and subsequently is output as Display Segment Data in a 16-bit (15 bit) one time operation.
- * This data sent to the Display Tube through the BUFFER (TC5066BP x 4) is exactly identical as in the case of the Timing Data.
- * For the purpose of latching this per 4-bit data to the TC4508BP, a Clock Signal is required, and this signal is output successively and in order by the Micro-Computer OT1 Terminal.
- * Figure 8 shows the Display Segment.

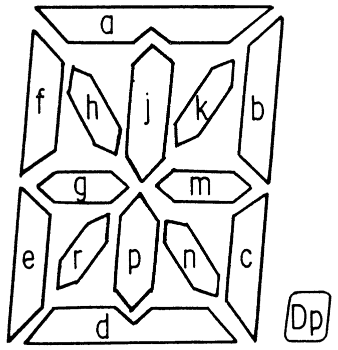

a
f
h
j
k
b
g
m
e
r
p
n
c
d
Dp

Figure 8.

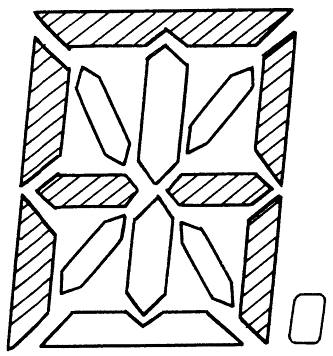


Figure 9.

- * Data transmission per 4 bits is in the following order —
  - (1) f, g, e, r
  - (2) Dp, d, n, p
  - (3) c, m, h, j
  - (4) —, a, b, k
- * For example, for the purpose of displaying the said letter "A", signals are output in the following order —
  - (1) 1, 1, 1, 0 (Hexadecimal of E)
  - (2) 0, 0, 0, 0 (Hexadecimal of O)
  - (3) 1, 1, 0, 0 (Hexadecimal of C)
  - (4) 0, 1, 1, 0 (Hexadecimal of 6)

Provided "1" = H
"0" = L
(Refer to Figure 9)

- * This 4 bit x 4 signal is in Figure 6 output from OT2 port to the timing represented by the slanted line portion.
- * Timing Chart becomes as shown in Figure 10. (When the said letter "A" is displayed in T2 Timing)

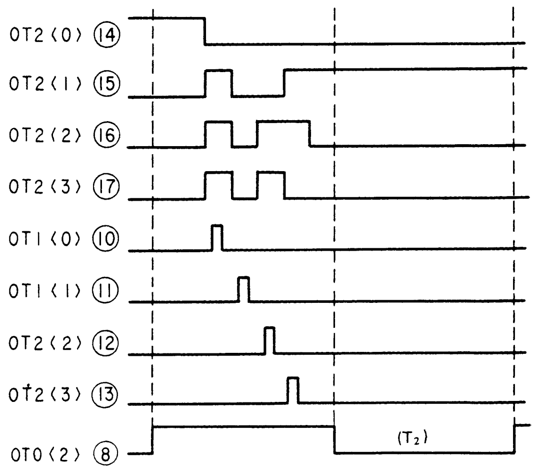
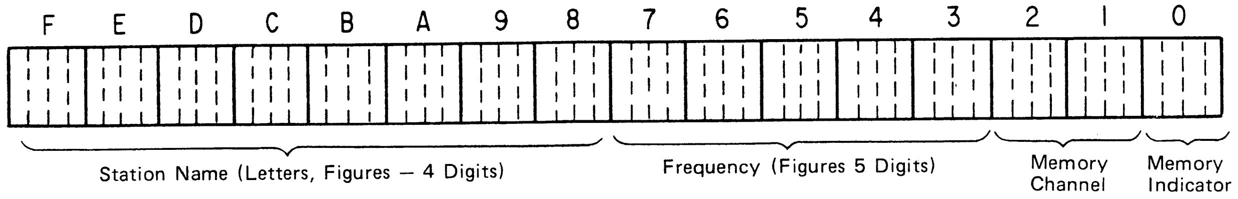

OT2 ⟨0⟩ ⑭
OT2 ⟨1⟩ ⑮
OT2 ⟨2⟩ ⑯
OT2 ⟨3⟩ ⑰
OT1 ⟨0⟩ ⑩
OT1 ⟨1⟩ ⑪
OT2 ⟨2⟩ ⑫
OT2 ⟨3⟩ ⑬
OT0 ⟨2⟩ ⑧
(T₂)

Figure 10.

3-3 Character Generator

- * Display Data is written into one portion of the Memory (RAM) within the Micro-Computer, and so long as the Receiving Station etc. remain unchanged, segment data outputs from this RAM embedded data.
- * Within the Micro-Computer TMP4320AP, a 4 bit x 128 word RAM sphere of influence exists within which, in turn, to the extent of 4 bit x 16 are embedded the abovementioned Display Data, namely, channel, frequency, station name etc.
- * An illustration of the Display Data housed in the RAM sphere of influence will be as shown in Figure 11 below —


F
E
D
C
B
A
9
8
7
6
5
4
3
2
1
0
Station Name (Letters, Figures — 4 Digits)
Frequency (Figures 5 Digits)
Memory Channel
Memory Indicator

(Note: 0, 1, 2, ----- E, F: Memory Address)

Figure 11.

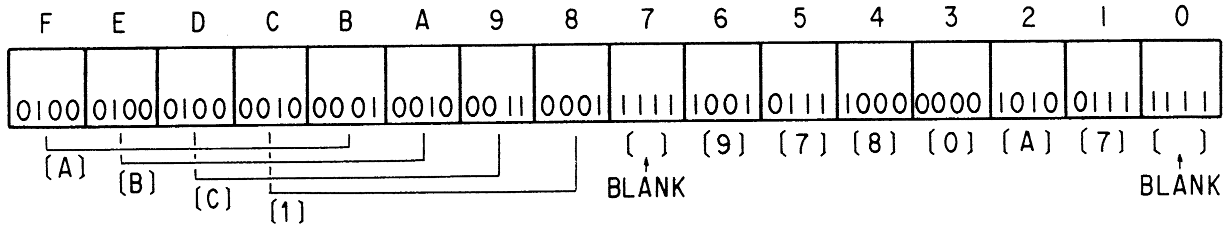
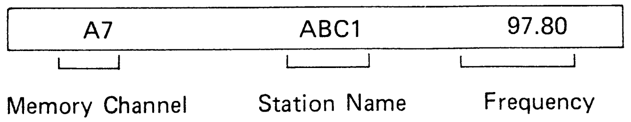

F
E
D
C
B
A
9
8
7
6
5
4
3
2
1
0
0100
0100
0100
0010
0001
0010
0011
0001
1111
1001
0111
1000
0000
1010
0111
1111
(A)
(B)
(C)
(1)
( )
BLANK
(9)
(7)
(8)
(0)
(A)
(7)
( )
BLANK

Figure 12.

- * As an example, Figure 12 shows Display Data RAM contents when the Display is as under —


A7
ABC1
97.80
Memory Channel
Station Name
Frequency

- * In respect to Segment Data, this data is not directly output. This RAM contained data is converted and then output. This converted portion is called Character Generator.
- * This Character Generator is one sector of the ROM sphere of influence within the Micro-Computer TMP4320AP and the number of bits correspond to 16 bit x 48 letters.
- * From the above example, the following conversion is obtained —

(Character generator)

0010 0001 ⟺ 1110 0000 1100 0110

and the letter "A" can be displayed.

Shows Data Flow

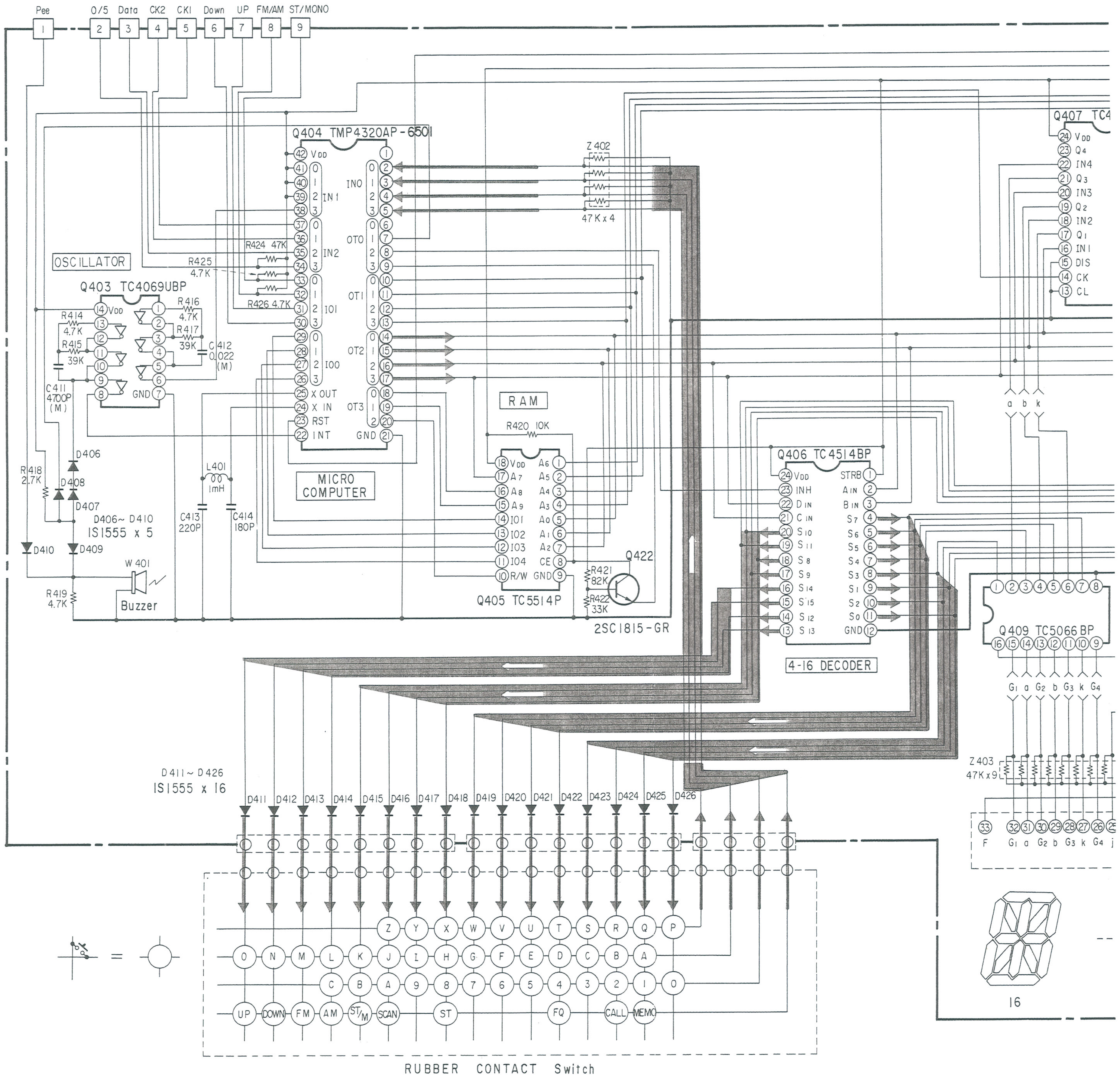

Pee
0/5
Data
CK2
CKI
Down
UP
FM/AM
ST/MONO
1
2
3
4
5
6
7
8
9
Q404 TMP4320AP-6501
VDD
IN0
IN1
IN2
IO1
IO0
OT0
OT1
OT2
OT3
X OUT
X IN
RST
INT
GND
MICRO COMPUTER
OSCILLATOR
Q403 TC4069UBP
R414 4.7K
R415 39K
R416 4.7K
R417 39K
C412 0.022 (M)
C411 4700P (M)
R424 47K
R425 4.7K
R426 4.7K
Z402
47K x 4
RAM
R420 10K
Q405 TC5514P
Q422
R421 82K
R422 33K
2SC1815-GR
L401 1mH
C413 220P
C414 180P
R418 2.7K
D406
D408
D407
D406~D410
1S1555 x 5
D410
D409
W401
Buzzer
R419 4.7K
Q406 TC4514BP
4-16 DECODER
Q407 TC4
Q409 TC5066BP
G1 a G2 b G3 k G4
Z403
47K x 9
F
D411~D426
1S1555 x 16
D411
D412
D413
D414
D415
D416
D417
D418
D419
D420
D421
D422
D423
D424
D425
D426
Z Y X W V U T S R Q P
O N M L K J I H G F E D C B A
C B A 9 8 7 6 5 4 3 2 1 0
UP DOWN FM AM ST/M SCAN ST FQ CALL MEMO
16
RUBBER CONTACT Switch

Figure 13.

4. Call Movements

Call Methods, as stated under 2. – Basic Movements, can be classified in five ways. Data movements at such time can be assumed to be as per the following three types –

(1) Data Input from the Key Matrix.
(2) Outside attached RAM (TC5514P) designated address and Data Input from RAM.
(3) Data Input for control of Controller (TC9137P).

and explanations thereon are furnished herebelow in sequential order –

4-1 Data Input from Key Matrix

* Figure 13 shows Data Flow.

* The Timing Data ($T_0 \sim T_{15}$) mentioned in 3-1 is also supplied to the Matrix Switch.
(TMP4320AP OT2 Port Decoder TC4514BP Output)

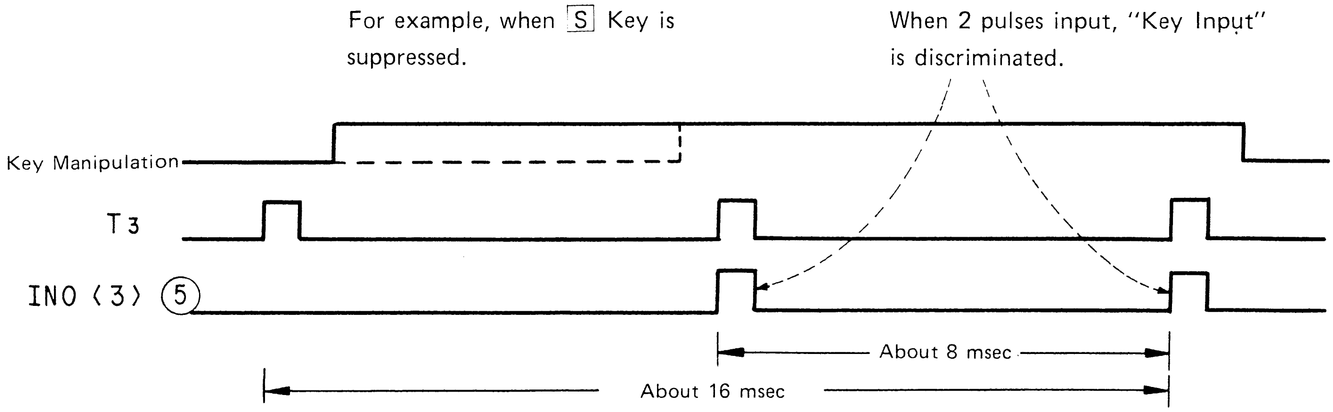
* The Key Matrix Switch possesses a capacity of Input 16 x Output 4 = 64 Keys, of which 49 keys are used.

* The Key Switch Output inputs into the Micro-Computer TM4320AP INO port and determines which of the keys within the Micro-Computer should be suppressed.

* As the input of the Micro-Computer TMP4320AP houses a program to prevent erroneous input, the continuous key suppression time (input continued running time) ranges between –
8 ~ 16 msec (Note)
The abovedescribed are required.

* In the event that data input does not occur in the Micro-Computer INO, output of Display Data alone habitually takes place, and therefore if and when input does happen to occur, Display is set Blank (OT0 <2>= L) and, in conformance with the input signal, movement is activated.

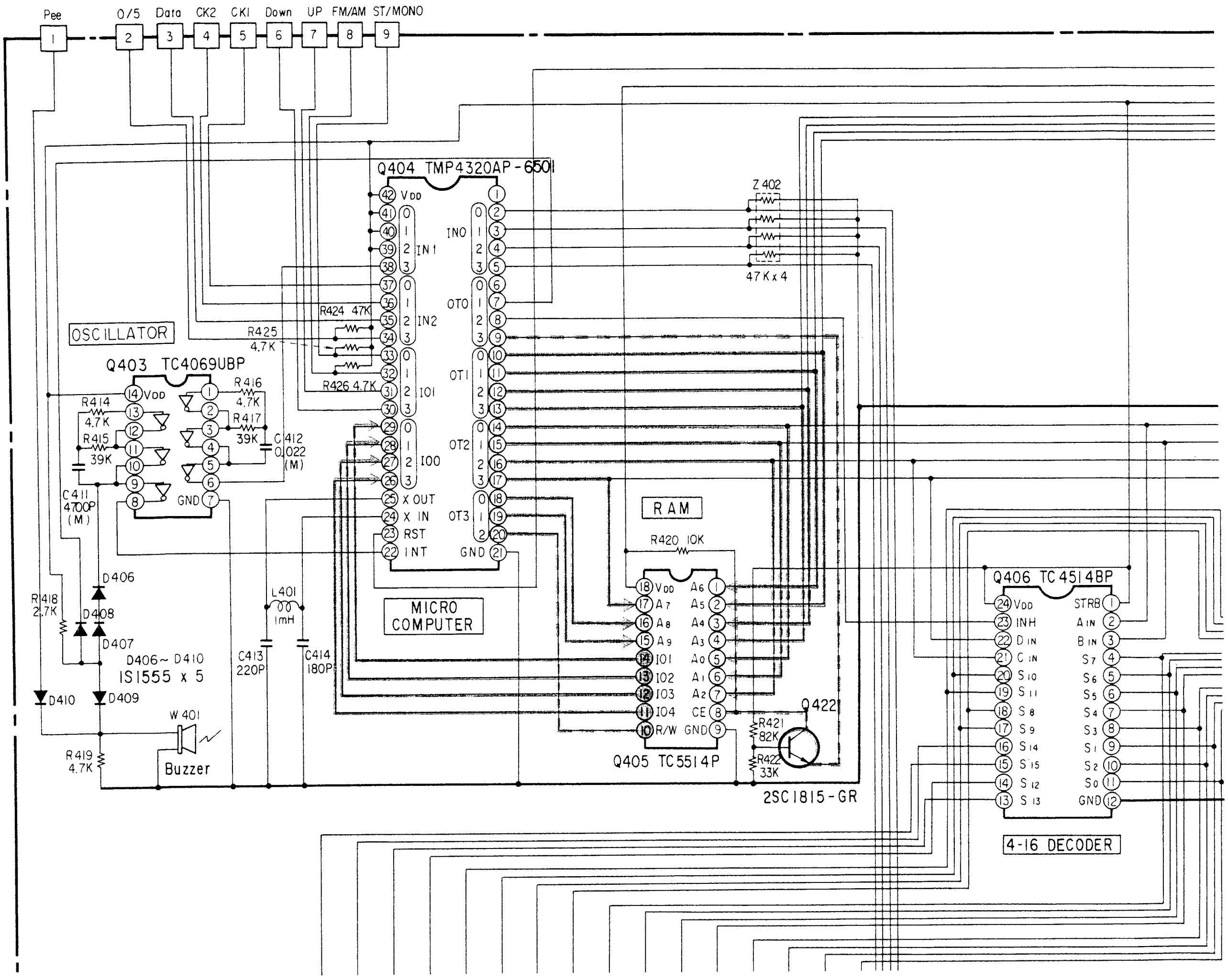
(Note) As per Key Input Timing.


For example, when S Key is suppressed.

When 2 pulses input, "Key Input" is discriminated.

Figure 14.

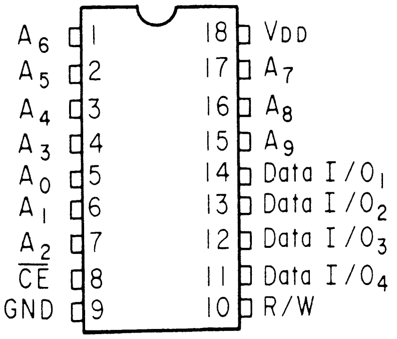
Designated Address and Data Flow



Pee
0/5
Data
CK2
CK1
Down
UP
FM/AM
ST/MONO
Q404 TMP4320AP-6501
VDD
IN1
IN2
IO1
IO0
IN0
OT0
OT1
OT2
OT3
X OUT
X IN
RST
INT
GND
MICRO COMPUTER
Z 402
47K x 4
OSCILLATOR
R425 4.7K
R424 47K
R426 4.7K
Q403 TC4069UBP
R414 4.7K
R415 39K
R416 4.7K
R417 39K
C412 0.022 (M)
C411 4700P (M)
D406
D408
D407
D406~D410 IS1555 x 5
D409
D410
R418 2.7K
R419 4.7K
W 401
Buzzer
L401 1mH
C413 220P
C414 180P
RAM
R420 10K
Q405 TC5514P
Q422
R421 82K
R422 33K
2SC1815-GR
Q406 TC4514BP
STRB
INH
A IN
B IN
D IN
C IN
4-16 DECODER

Figure 15.

TC5514P

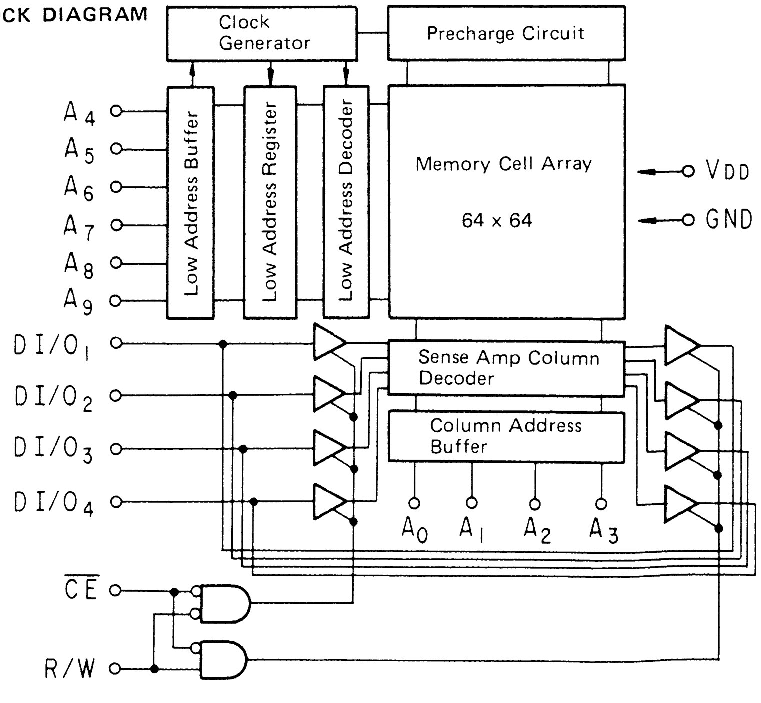


A6 1
A5 2
A4 3
A3 4
A0 5
A1 6
A2 7
CE 8
GND 9
18 VDD
17 A7
16 A8
15 A9
14 Data I/O1
13 Data I/O2
12 Data I/O3
11 Data I/O4
10 R/W

PIN NAME

$A_0 \sim A_9$	Address Input
R/W	Lead Light Input
CE	Tip Enable Input
Data $I/O_{1\sim 4}$	Data Input Output
V_{DD}/GND	Power Source

BLOCK DIAGRAM



Clock Generator
Precharge Circuit
Low Address Buffer
Low Address Register
Low Address Decoder
Memory Cell Array
64 x 64
VDD
GND
A4
A5
A6
A7
A8
A9
DI/O1
DI/O2
DI/O3
DI/O4
Sense Amp Column Decoder
Column Address Buffer
A0
A1
A2
A3
CE
R/W

4-2 Outside Attached RAM (TC5514P) Designated Address and Data Input from RAM

- * As the TC5514P embodies Address Input, ranging from $A_0 \sim A_9$ ($2.^{10}$) with capability of 4 bit data being memorized per each address, then the capacity existing is 4 x 1024 bits.
- * Figure 15 indicates these Designated Addresses and Data Flow.
- * The relationship between the Memory Channel and the Address is shown in Figure 16.

Micro-Computer	OT3		OT2				
Output	1	0	3	2	1	0	
Memory Channel / Ram Address	A_9	A_8	A_7	A_2	A_1	A_0	
A0	0	1	0	0	0	0	
A1	0	1	0	0	0	1	
A2	0	1	0	0	1	0	
A3	0	1	0	0	1	1	
A4	0	1	0	1	0	0	
A5	0	1	0	1	0	1	
A6	0	1	0	1	1	0	
A7	0	1	0	1	1	1	
A8	0	1	1	0	0	0	
A9	0	1	1	0	0	1	
B0	1	0	0	0	0	0	
B1	1	0	0	0	0	1	
⋮							
C0	1	1	0	0	0	0	
⋮							
C9	1	1	1	0	0	1	
Last Channel	0	0	0	0	0	0	(Note)

(Note)
Used in the last channel memory when the power is off.

Figure 16.

- * 16 (x 4 bit) respective data are housed in each channel of the total of 30 channels shown in Figure 17. The 16 word Designating Matrix within these identical channels are OT1 port (A_3, A_4, A_5, A_6).
- * The memory contents of each channel are arranged as under –

Address (16 Hexadecimals)		F E D C B A 9 8	7 6 5 4 3	2 1	0	
OT1	0 <A_5>	1 0 1 0 1 0 1 0	1 0 1 0 1	0 1	0	
	1 <A_6>	1 1 0 0 1 1 0 0	1 1 0 0 1	1 0	0	* FM/AM STEREO/ MONO
	2 <A_4>	1 1 1 1 0 0 0 0	1 1 1 1 0	0 0	0	
	3 <A_3>	1 1 1 1 1 1 1 1	0 0 0 0 0	0 0	0	
Contents		Station Name	Frequency	Blank	*	

Figure 17.

- * Arrangement of Data Input from RAM (TC5514P) is as under
  - (1) OT0 <2> = H with Display set blank.
  - (2) Memory, Channel, Address (A0 ~ C9) are output from OT2, OT3 ports. (Note)
  - (3) Designated Digit Address (0, 1, 2, ----- E, F) are output from OT1 port.
  - (4) IO0 port is made Input port.
  - (5) By setting OT0 <3> Port H → L → H, transmission is effected to RAM CE (Chip Enable) Terminal (8 pin) thereby transmitting RAM data.
  - (6) This data is input from IO0.

(Note) In this case, OT3 <2> = H and signifies that this is "READ" from RAM.

Data Input/Output Controller

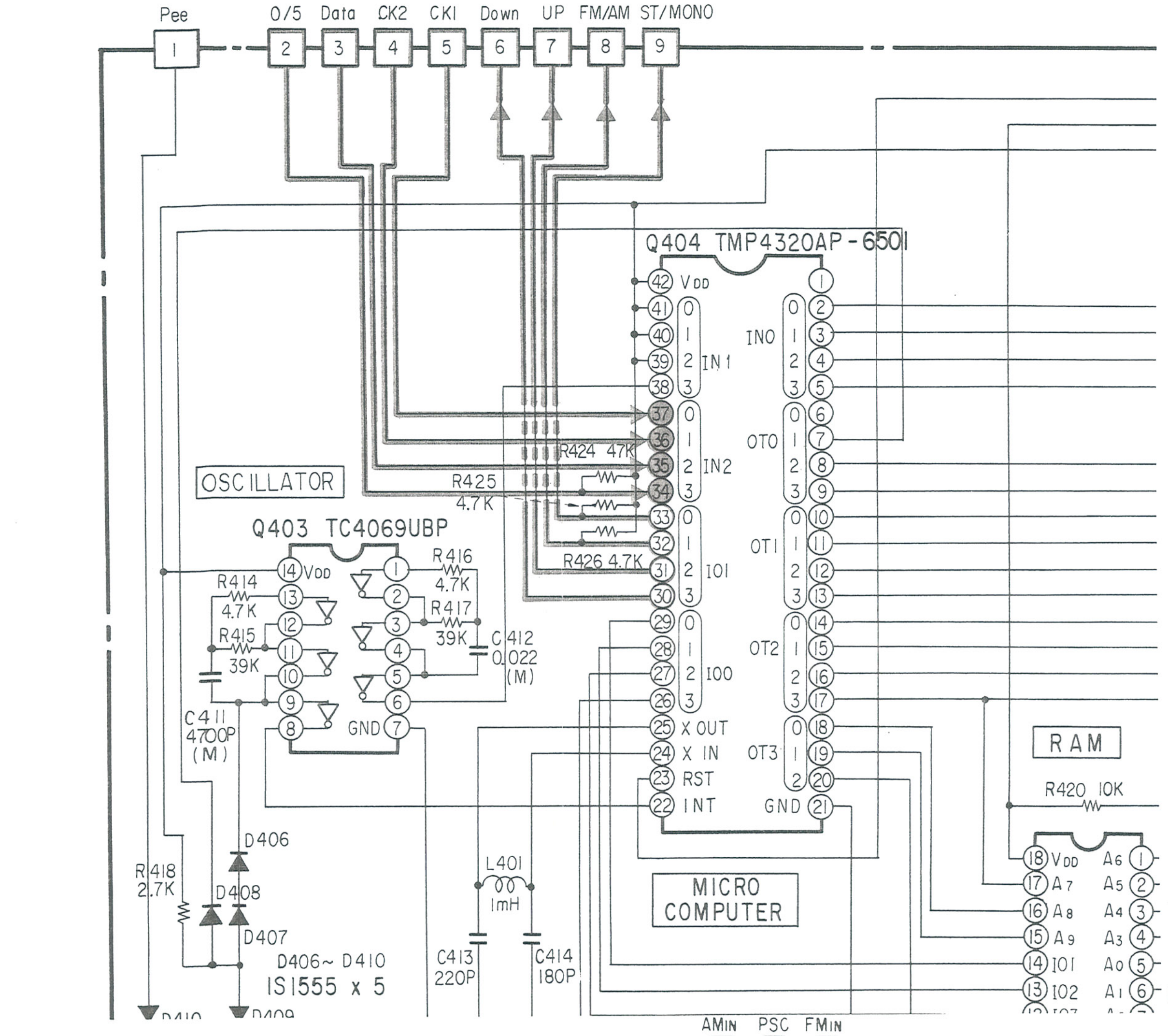
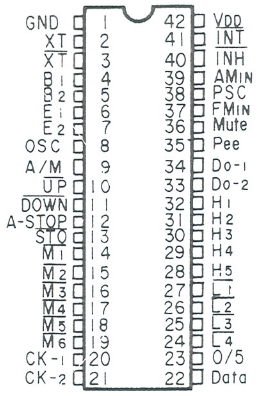
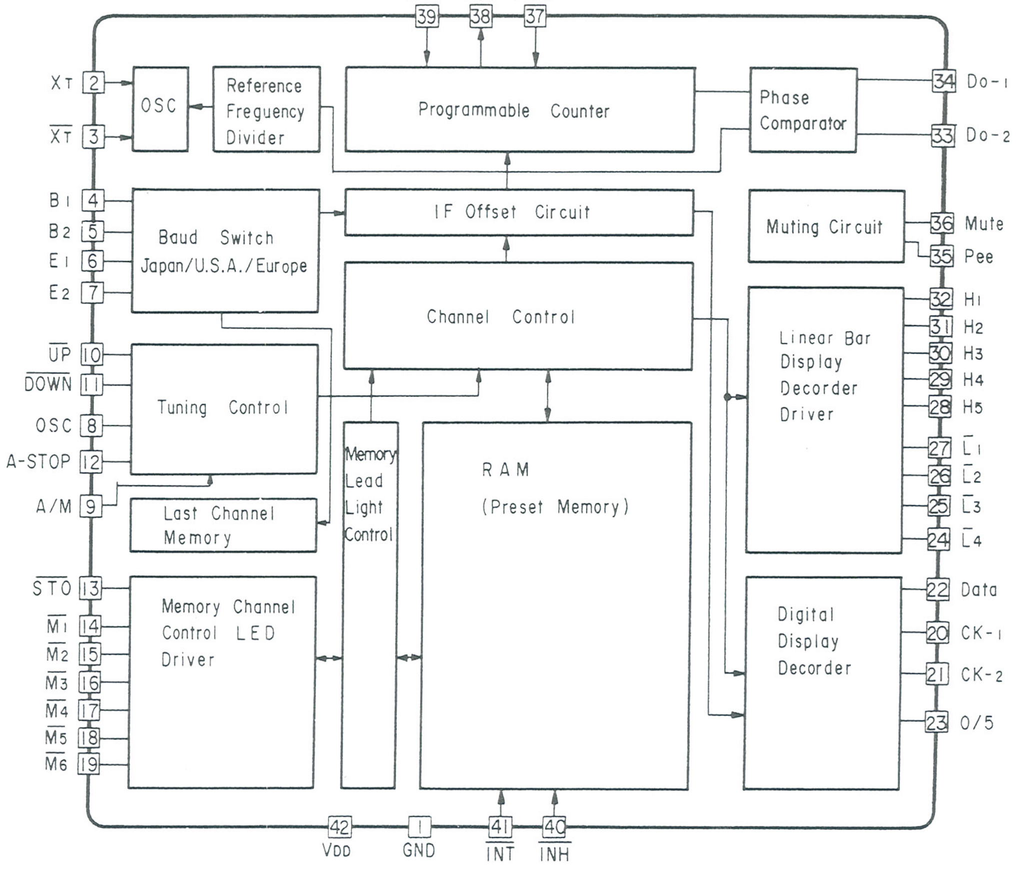

Pee 1
0/5 2
Data 3
CK2 4
CK1 5
Down 6
UP 7
FM/AM 8
ST/MONO 9
Q404 TMP4320AP-6501
VDD
IN0
IN1
IN2
IO1
IO0
OT0
OT1
OT2
OT3
X OUT
X IN
RST
INT
GND
R424 47K
R425 4.7K
R426 4.7K
OSCILLATOR
Q403 TC4069UBP
VDD
GND
R416 4.7K
R417 39K
R414 4.7K
R415 39K
C412 0.022 (M)
C411 4700P (M)
R418 2.7K
D406
D408
D407
D406~D410 1S1555 x 5
L401 1mH
C413 220P
C414 180P
MICRO COMPUTER
RAM
R420 10K
VDD
A7
A8
A9
IO1
IO2
A6
A5
A4
A3
A0
A1

Figure 18.

TC9137P


GND 1
XT 2
XT 3
B1 4
B2 5
E1 6
E2 7
OSC 8
A/M 9
UP 10
DOWN 11
A-STOP 12
STO 13
M1 14
M2 15
M3 16
M4 17
M5 18
M6 19
CK-1 20
CK-2 21
42 VDD
41 INT
40 INH
39 AMIN
38 PSC
37 FMIN
36 Mute
35 Pee
34 Do-1
33 Do-2
32 H1
31 H2
30 H3
29 H4
28 H5
27 L1
26 L2
25 L3
24 L4
23 0/5
22 Data


AMIN 39
PSC 38
FMIN 37
XT 2
XT 3
OSC
Reference Frequency Divider
Programmable Counter
Phase Comparator
34 Do-1
33 Do-2
B1 4
B2 5
E1 6
E2 7
Baud Switch Japan/U.S.A./Europe
IF Offset Circuit
Muting Circuit
36 Mute
35 Pee
Channel Control
Linear Bar Display Decorder Driver
32 H1
31 H2
30 H3
29 H4
28 H5
27 L1
26 L2
25 L3
24 L4
UP 10
DOWN 11
OSC 8
A-STOP 12
A/M 9
Tuning Control
Last Channel Memory
Memory Lead Light Control
RAM (Preset Memory)
STO 13
M1 14
M2 15
M3 16
M4 17
M5 18
M6 19
Memory Channel Control LED Driver
Digital Display Decorder
22 Data
20 CK-1
21 CK-2
23 0/5
42 VDD
1 GND
41 INT
40 INH

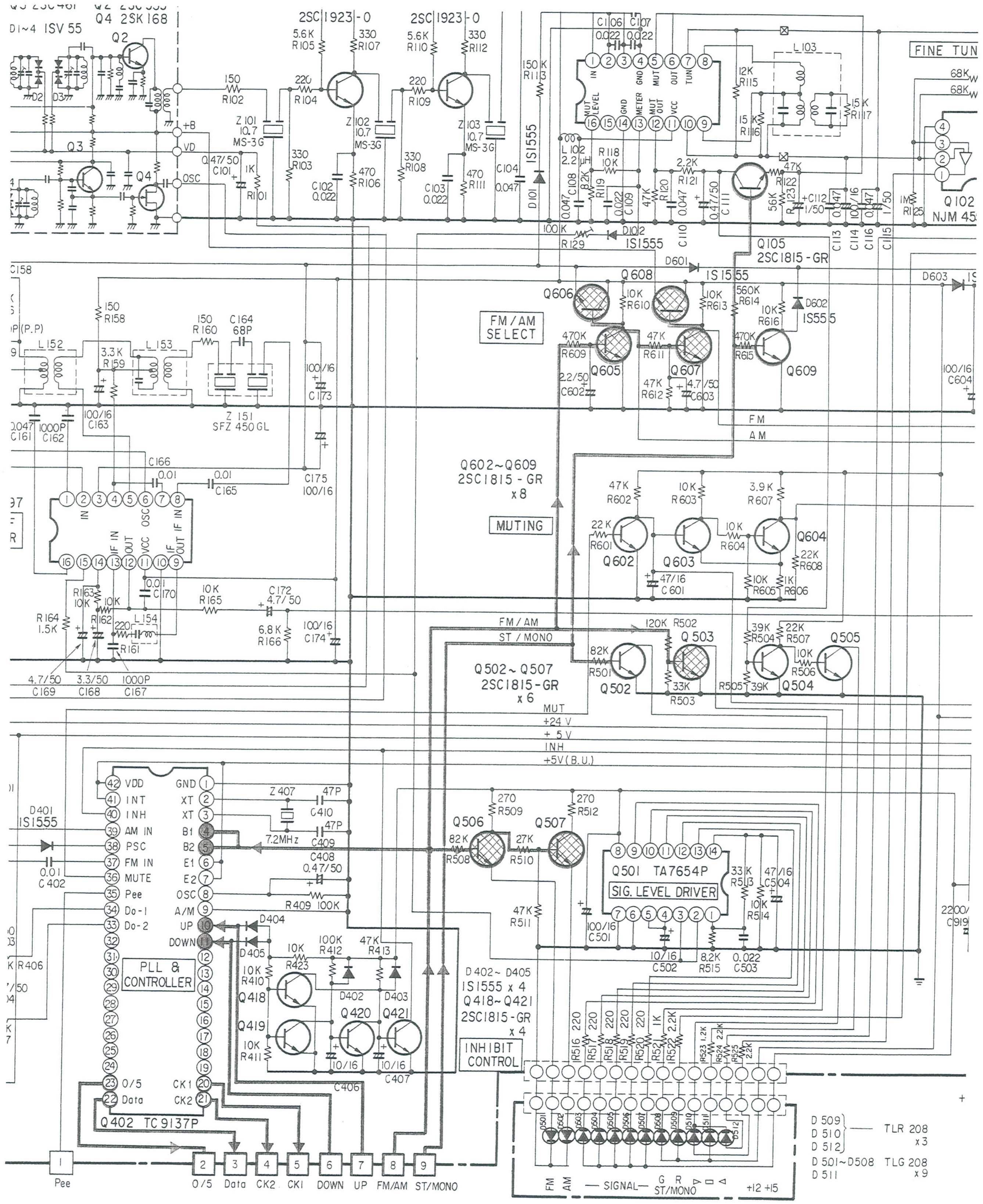

Q4 2SK168
D1~4 1SV55
Q2
Q3
Q4
+B
VD
OSC
2SC1923-0
5.6K R105
330 R107
5.6K R110
330 R112
150 R102
220 R104
220 R109
Z101 10.7 MS-3G
Z102 10.7 MS-3G
Z103 10.7 MS-3G
330 R103
330 R108
470 R106
470 R111
C102 0.022
C103 0.022
C104 0.047
D101
1S1555
150K R113
C106 0.022
C107 0.022
L103
12K R115
15K R116
15K R117
L102 2.2μH
R118 10K
C108 0.047
C109 0.022
2.2K R121
47K R122
C112 1/50
Q105 2SC1815-GR
D102 1S1555
100K R129
FINE TUNING
68K
Q102 NJM45
D601
1S1555
D602 1S555
D603
Q606
Q608
Q605
Q607
Q609
10K R610
10K R613
560K R614
10K R616
470K R609
470K R615
47K R611
47K R612
2.2/50 C602
4.7/50 C603
FM/AM SELECT
FM
AM
150 R158
150 R160
C164 68P
L152
L153
3.3K R159
Z151 SFZ450GL
100/16 C173
100/16 C604
C161 0.047
1000P C162
100/16 C163
C166 0.01
0.01 C165
C175 100/16
Q602~Q609 2SC1815-GR x 8
MUTING
47K R602
10K R603
3.9K R607
22K R601
10K R604
22K R608
Q602
Q603
Q604
47/16 C601
10K R605
1K R606
IF IN
OUT
VCC
OSC
MUT
IF OUT
IF IN
R163 10K
10K R162
0.01 C170
10K R165
C172 4.7/50
R164 1.5K
L154
220 R161
6.8K R166
100/16 C174
4.7/50 C169
3.3/50 C168
1000P C167
FM/AM
ST/MONO
82K R501
120K R502
Q503
39K R504
22K R507
10K R506
Q505
33K R503
39K R505
Q502
Q504
Q502~Q507 2SC1815-GR x 6
MUT
+24V
+5V
INH
+5V(B.U.)
D401 1S1555
0.01 C402
R406
Q402 TC9137P
VDD
INT
INH
AM IN
PSC
FM IN
MUTE
Pee
Do-1
Do-2
GND
XT
B1
B2
E1
E2
OSC
A/M
UP
DOWN
0/5
Data
CK1
CK2
PLL & CONTROLLER
Z407
7.2MHz
47P C410
47P C409
C408 0.47/50
R409 100K
D404
D405
10K R423
100K R412
47K R413
10K R410
10K R411
D402
D403
Q418
Q419
Q420
Q421
10/16 C406
10/16 C407
D402~D405 1S1555 x 4
Q418~Q421 2SC1815-GR x 4
INHIBIT CONTROL
Q506
Q507
270 R509
270 R512
82K R508
27K R510
47K R511
Q501 TA7654P
SIG. LEVEL DRIVER
33K R513
47/16 C504
10K R514
100/16 C501
10/16 C502
8.2K R515
0.022 C503
R516 220
R517 220
R518 220
R519 220
R520 220
R521 1K
R522 2.2K
R523 1.2K
2200/ C919
D509
D510
D512
TLR208 x3
D501~D508 D511
TLG208 x9
FM
AM
SIGNAL
G R ST/MONO
+12 +15
Pee
0/5
Data
CK2
CK1
DOWN
UP
FM/AM
ST/MONO

Figure 19.

4-3 Data Input/Output of Controller (TC9137P)

* As shown in Figure 18 and Figure 19, data exchanges between TMP4320AP and TC9137P are as under –

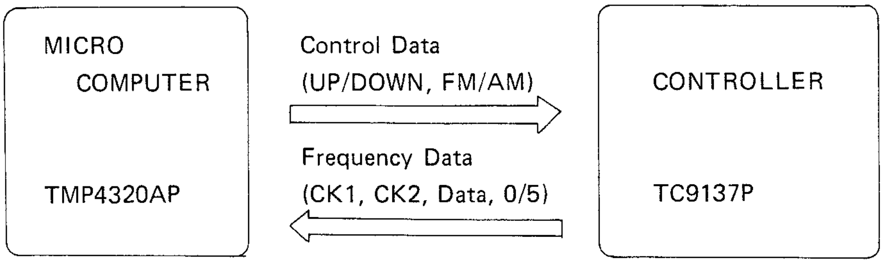
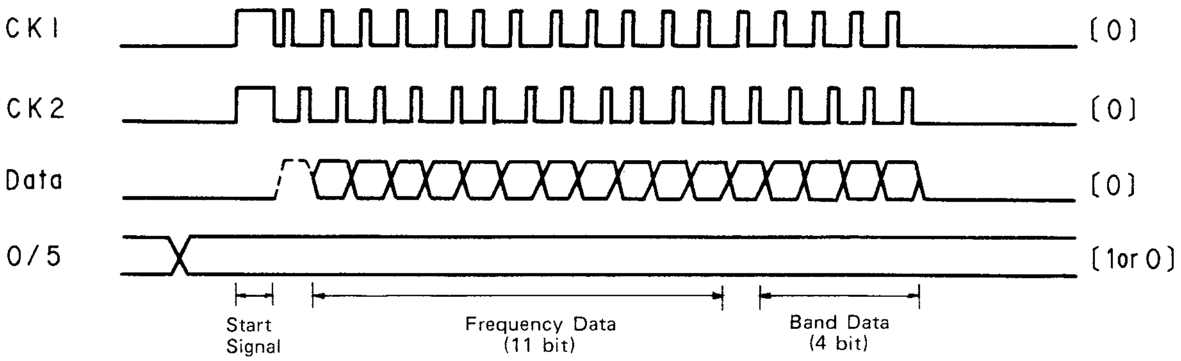

MICRO COMPUTER
TMP4320AP
Control Data
(UP/DOWN, FM/AM)
Frequency Data
(CK1, CK2, Data, 0/5)
CONTROLLER
TC9137P

Figure 20.

* Frequency Data is not output during reception from a fixed station. Only when the receiving situation undergoes a change does output take place and then only once.

* Data from TC9137P is, as shown in Figure 21, composed of two (2) Clock Signals, one (1) Data Signal, and a +50 kHz Discriminating Signal (when FM) –


CK1
CK2
Data
0/5
[0]
[0]
[0]
[1or0]
Start Signal
Frequency Data (11 bit)
Band Data (4 bit)

* This Frequency Data is the output of only one (1) cycle and thus does not mean that the Input (IN2) is always open. It is only when the Control Signal (Up/Down, FM/AM) outputs from IO1 Port that Data Input takes place.

* Control Signals are output as under –

As Low Active Signals when UP/DOWN

As FM = H, AM = L fixed normal signals upon FM/AM switchings.

* Furthermore, while TC9137P does not control, STEREO/MONO control signals do output also from the Micro-Computer.

* As can be seen and comprehended from Figure 18 and Figure 19, Control Signals are transmitted also to each Transiter as under –

IO1 <1> [FM/AM] ——→ Q506, Q507, Q503,
Q605, Q606, Q607, Q608

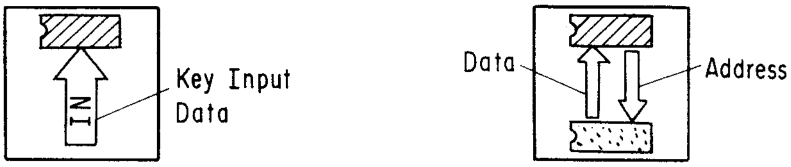
IO1 <0> [STEREO/MONO] ——→ Q502, Q509, Q105

4-4 Call Movements

- * As mentioned in Paragraph 2 – Basic Movements, five (5) types of Call Methods exist and dependent upon these differences, Data Movements differ.
- * However, as basically the combination is as the abovementioned 4-1 ~ 4-3, let us for simplicity sake show by illustrations –

Data Input from Key Matrix

Data Input from Micro-Computer to RAM and from Address Designated Ram to Micro-Computer

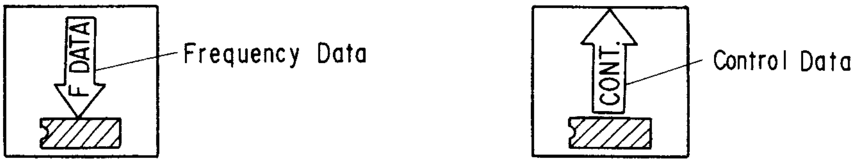

IN
Key Input Data
Data
Address

(4.1)

(4.2)

Data Input from Controller

Control Signal Output


F DATA
Frequency Data
CONT.
Control Data

(4.3)

(4.3)

Provided ▨ TMP4320AP
░ TC5514P

Figure 22.

An illustration of the simple abridged drawing shown under Figure 22 of Data Movements upon Calls is as given herebelow –

① STATION CALL

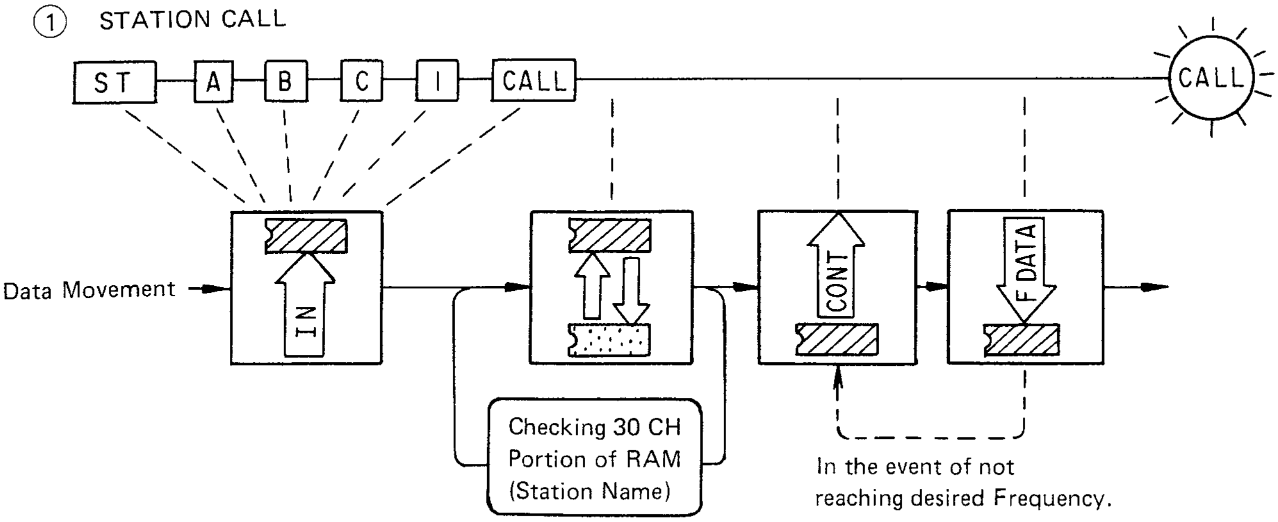

ST
A
B
C
I
CALL
CALL
Data Movement
IN
CONT
F DATA
Checking 30 CH Portion of RAM (Station Name)
In the event of not reaching desired Frequency.

Figure 23.

② FREQUENCY CALL

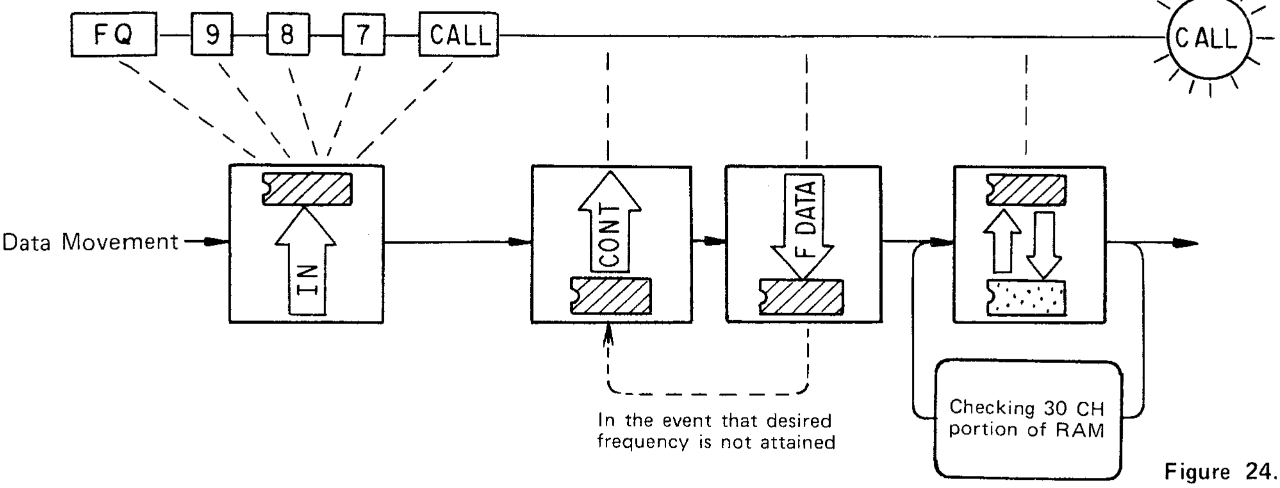

FQ
9
8
7
CALL
CALL
Data Movement
IN
CONT
F DATA
In the event that desired frequency is not attained
Checking 30 CH portion of RAM

Figure 24.

③ PRESET MEMORY CHANNEL CALL

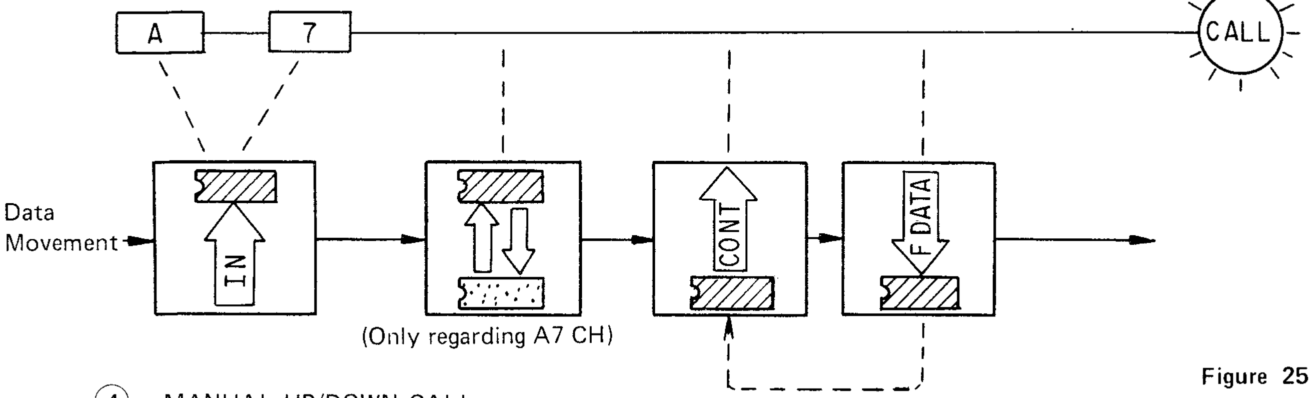

A
7
CALL
Data Movement
IN
CONT
F DATA
(Only regarding A7 CH)

Figure 25.

④ MANUAL UP/DOWN CALL

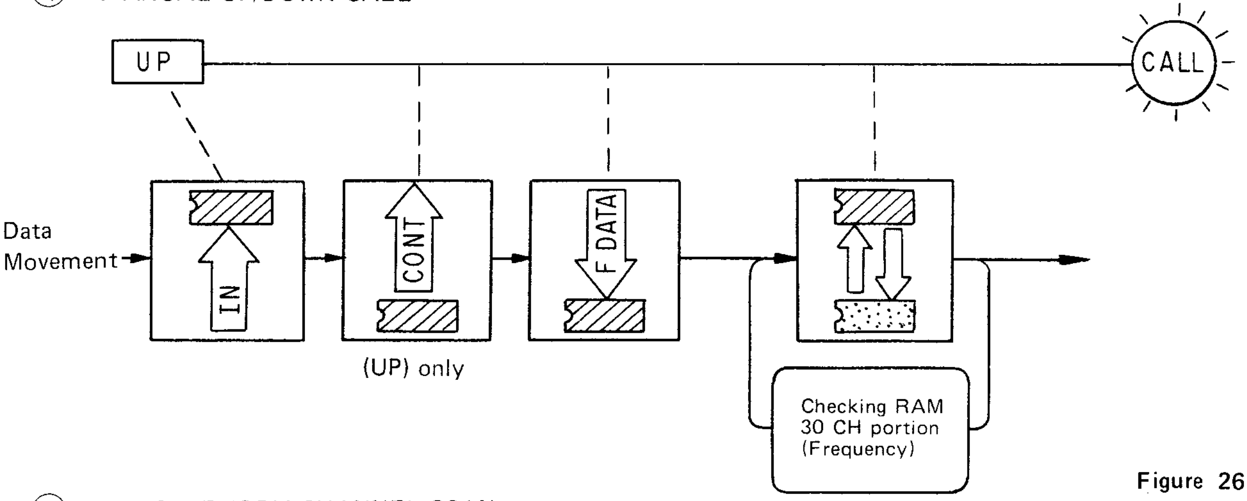

UP
CALL
Data Movement
IN
CONT
F DATA
(UP) only
Checking RAM 30 CH portion (Frequency)

Figure 26.

⑤ AUTO MEMORY CHANNEL SCAN

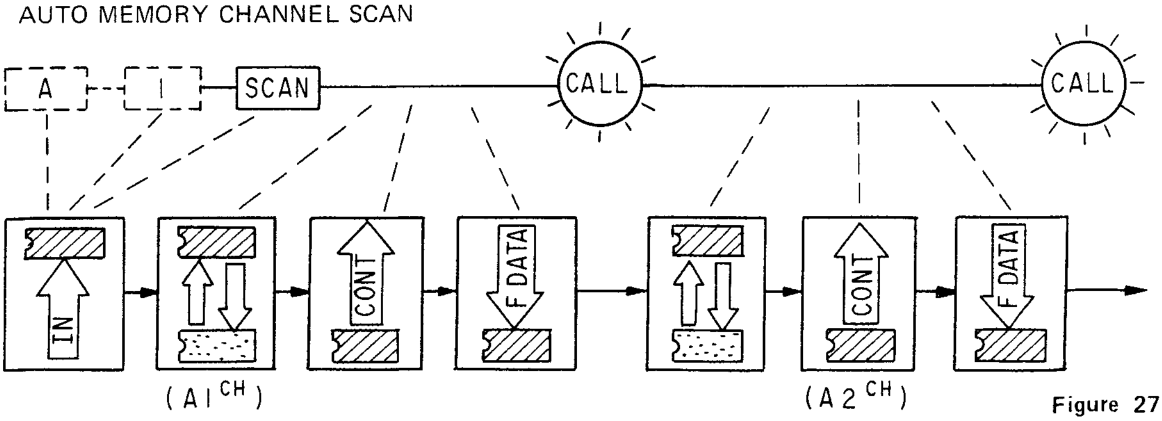

A
1
SCAN
CALL
CALL
IN
CONT
F DATA
CONT
F DATA
(A1 CH)
(A2 CH)

Figure 27.

5. Movements Upon Memorizing

* In relation to the Data Line between Micro-Computer TMP4320AP and Memory (RAM) TC5514P, the data movement when memorizing could well be considered in reverse, when reading data from the RAM because the Input/Output are common to both.

* In Figure 28, Data Flow is shown.

* Differences in Readings are represented by –

OT3 <2> = L

and with this signal, "WRITE" is directed or designated.

* Designating ADDRESS is exactly the same as with READING and conforms with Figure 16 and Figure 17.

* The process of directing WRITE to the RAM is as under –

(1) OT0 <2> = H. Display is set blank.

(2) Memory Channel Address (A0 ~ C9) outputs from OT2, OT3 ports. **(Note)** OT3 <2> = L

(3) Digit Designated Address (0, 1, 2, -----, F) outputs from OT1.

(4) J00 port is made Output Port.

(5) Data which must be memorized is transmitted.

(6) OT0 <3> port as H → L → H is transmitted to CE Terminal and data memorized.

Data Flow is Shown

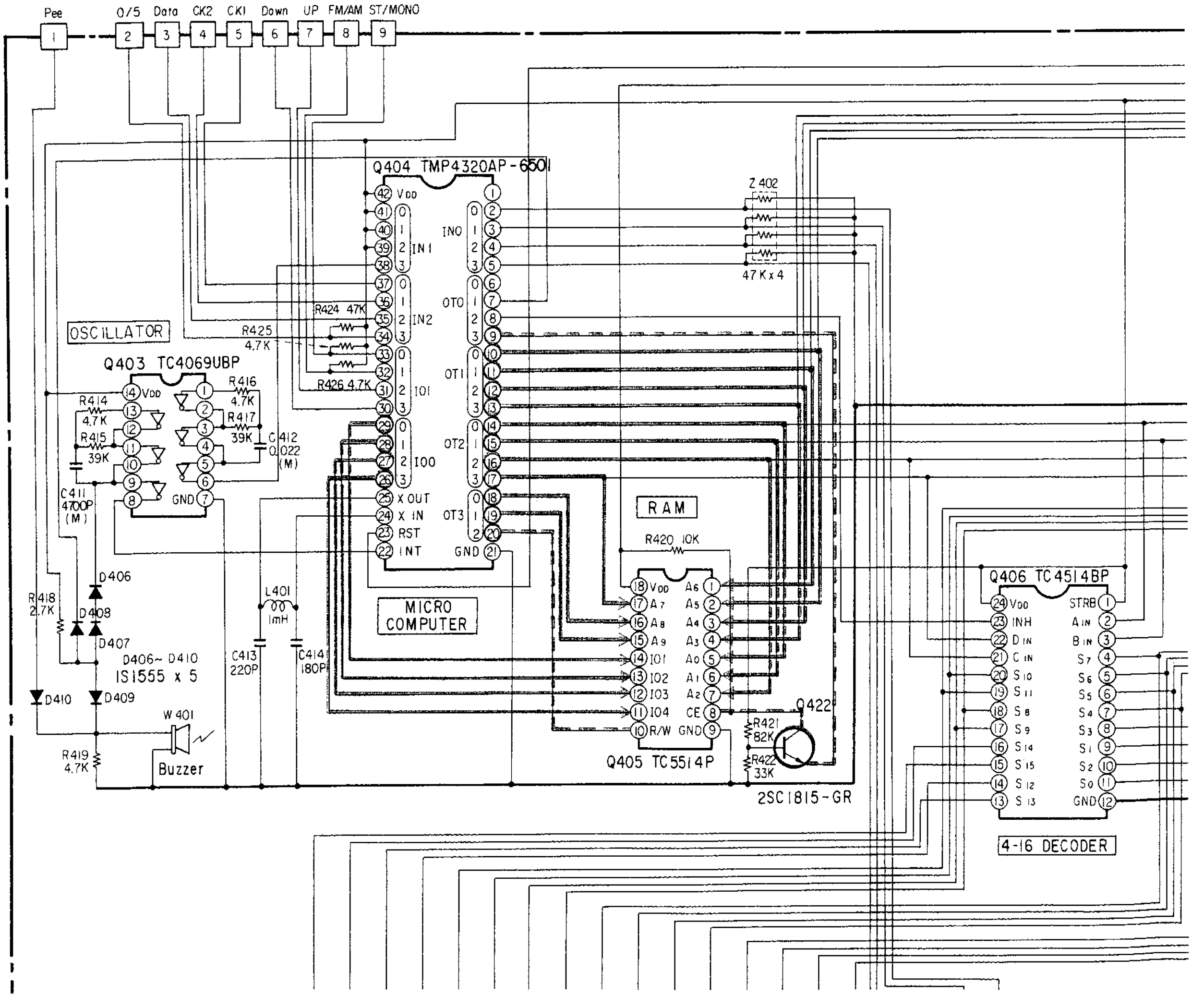

Pee
0/5
Data
CK2
CK1
Down
UP
FM/AM
ST/MONO
Q404 TMP4320AP-650I
VDD
IN0
IN1
IN2
IO1
IO0
OT0
OT1
OT2
OT3
X OUT
X IN
RST
INT
GND
MICRO COMPUTER
Z402
47Kx4
R424 47K
R425 4.7K
R426 4.7K
OSCILLATOR
Q403 TC4069UBP
R414 4.7K
R415 39K
R416 4.7K
R417 39K
C412 0.022 (M)
C411 4700P (M)
D406
D407
D408
D406~D410 1S1555 x 5
D409
D410
R418 2.7K
R419 4.7K
W401
Buzzer
L401 1mH
C413 220P
C414 180P
RAM
R420 10K
Q405 TC5514P
VDD
A7
A8
A9
IO1
IO2
IO3
IO4
R/W
A6
A5
A4
A3
A0
A1
A2
CE
GND
Q422
R421 82K
R422 33K
2SC1815-GR
Q406 TC4514BP
VDD
INH
DIN
CIN
STRB
AIN
BIN
GND
4-16 DECODER

Figure 28.

6. Others

UP/DOWN Control Pulse

While UP/DOWN pulse is output from Micro-Computer TMP4320AP to Controller TC9137P, this pulse cycle can be adjusted, which is represented by INI <3> Input (㊳ Pin) while in the ST-S80 the cycle is made fixed by the vibrator.

INTERRUPT

The (㉒ Pin) of the Micro-Computer serves as the INTERRUPT Terminal and with this frequency, the Timing Data (T_0 ~ T_{15}) cycle is determined.

SQUEAK SOUND

This sound arises when the Key Matrix is suppressed and when frequency transfers occur. The source of the sound is the oscillating or vibrating device Q403 (TC4069UBP) and TC9137P, two in number.

DATA DIFFERENCES ACCORDING TO AREAS

* As for the TC9137P, by manipulation of ⑥ and ⑦ Pins, it is possible to cope with the following territories –

1. Europe	(FM 50 kHz step, 87.5 ~ 108 MHz; AM 9 kHz step)
2. U.S.A.	(FM 100 kHz step, 87.5 ~ 108 MHz; AM 10 kHz step)
3. JAPAN	(FM 100 kHz step, 78.0 ~ 90.0 MHz; AM 9 kHz step)

* By the discriminating signal (band data) from the TC9137P and also by the Micro-Computer TMP4320AP, it is possible to automatically effect the abovementioned discriminations.

* Provided that, with the FM, the following is adhered to –

Europe	50 Hz step
Japan, U.S.A.	100 Hz step

to achieve which Discriminating Terminals (㊶ Pin) are set up also in the TMP1320AP.

It is fit and in order to set them up as under –

Europe	(50 kHz step)	(H)
Japan, U.S.A.	(100 kHz step)	(L)

* The erroneous description in "ALIGNMENT INSTRUCTION" on Page 10 of SERVICE DATA (File No. 170-139) is corrected as figure below.

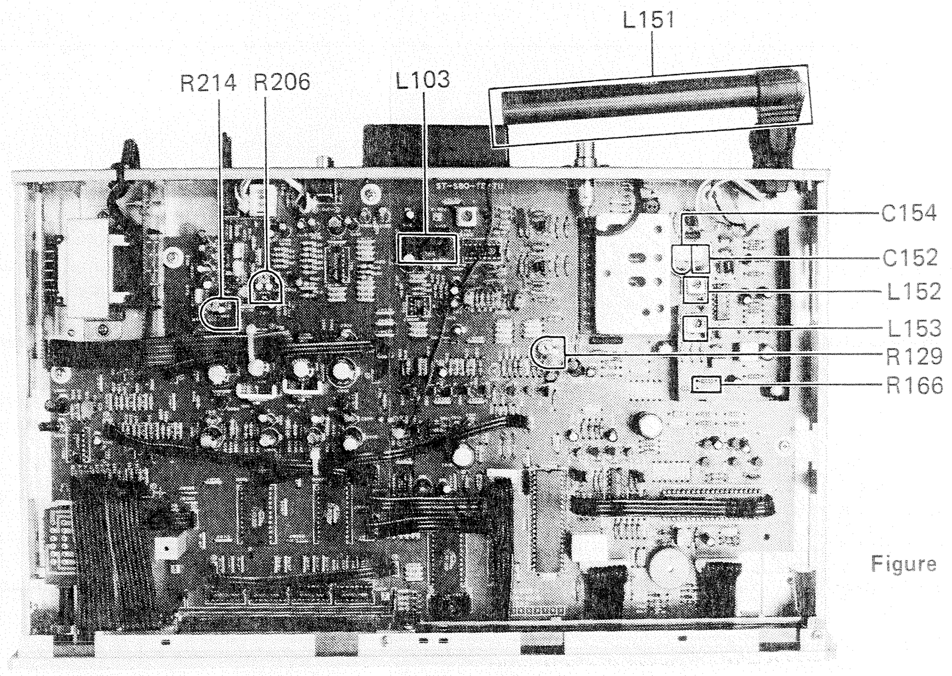


Figure 29.

AM ADJUSTMENT

IF ADJUSTMENT

Step	Adjustment	Remarks
IF Response	L153	Adjust for scope pattern with specified marker (450 KHz) as illustrated in Figure 30.

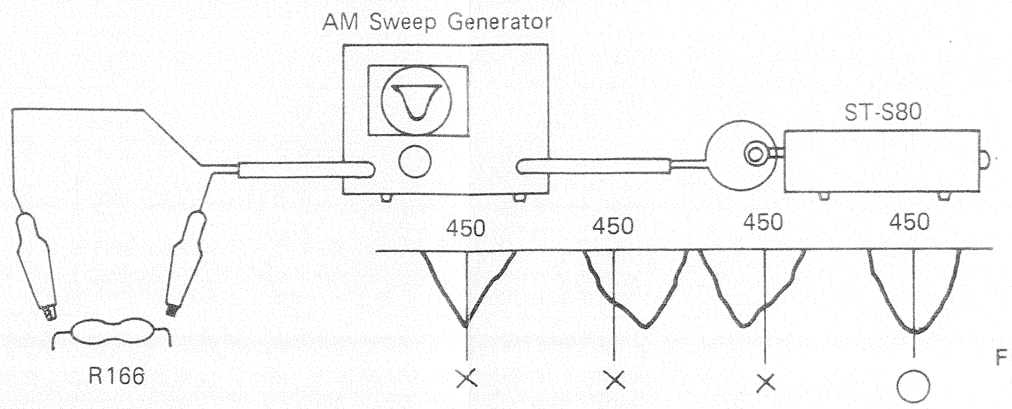


Figure 30.

SCHEMATIC DIAGRAM

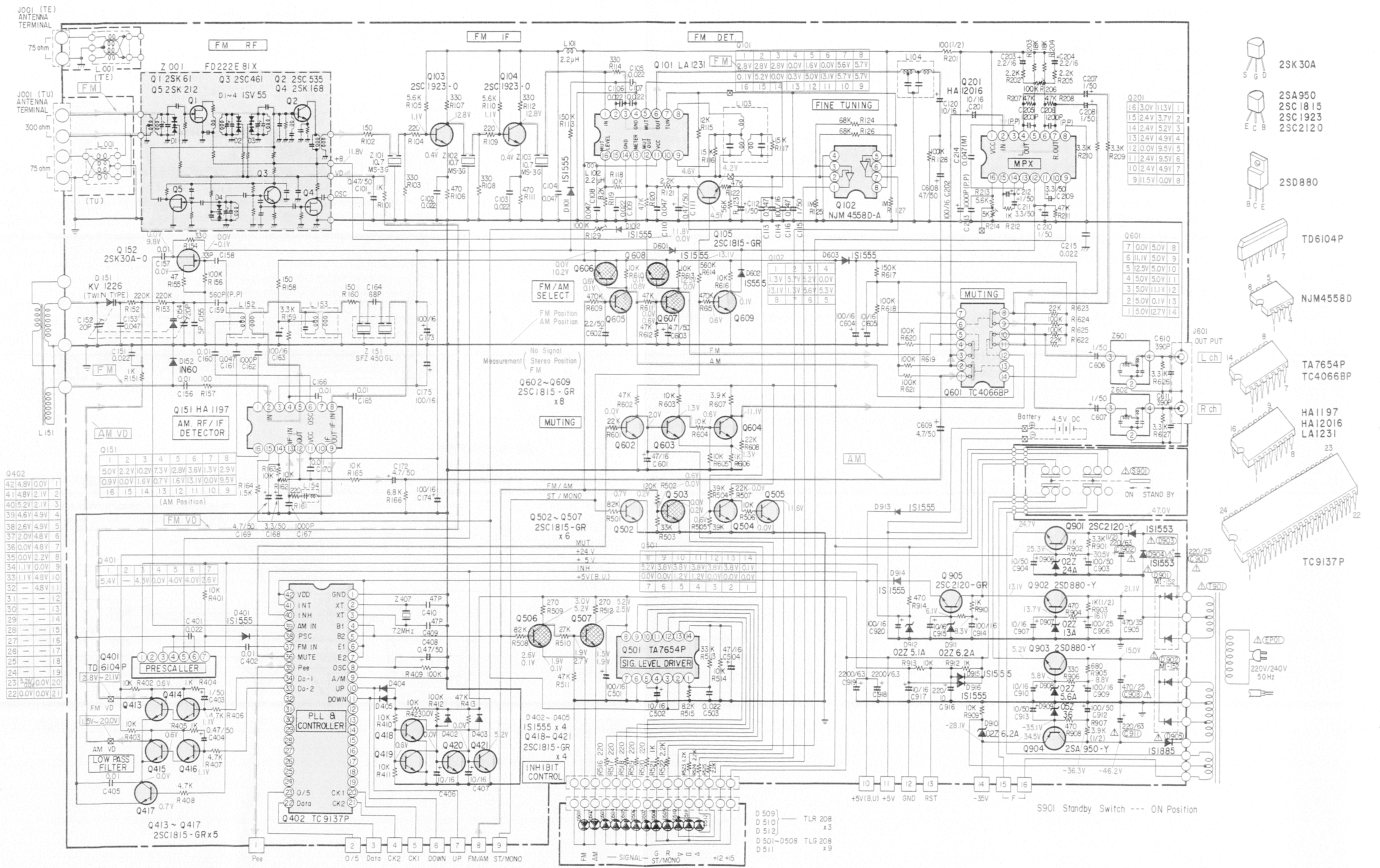

J001 (TE) ANTENNA TERMINAL
75 ohm
J001 (TU) ANTENNA TERMINAL
300 ohm
75 ohm
L001 (TE)
L001 (TU)
FM RF
Z001 FD222E81X
Q1 2SK61 Q3 2SC461 Q2 2SC535
Q5 2SK212 Q4 2SK168
D1~4 1SV55
FM IF
Q103 2SC1923-O
Q104 2SC1923-O
Z101 10.7 MS-3G
Z102 10.7 MS-3G
Z103 10.7 MS-3G
FM DET.
Q101 LA1231
FINE TUNING
Q102 NJM4558D-A
Q201 HA12016
MPX
Q152 2SK30A-O
D151 KV1226 (TWIN TYPE)
Q151 HA1197
AM. RF/IF DETECTOR
Z151 SFZ450GL
D152 1N60
FM/AM SELECT
FM Position
AM Position
Measurement (No Signal, Stereo Position, FM)
Q602~Q609 2SC1815-GR x8
MUTING
Q601 TC4066BP
J601 OUT PUT
L ch
R ch
Battery 4.5V DC
S901
ON STAND BY
Q502~Q507 2SC1815-GR x6
Q501 TA7654P SIG. LEVEL DRIVER
Q401 TD6104P
PRESCALLER
LOW PASS FILTER
Q413~Q417 2SC1815-GR x5
Q402 TC9137P
PLL & CONTROLLER
D402~D405 1S1555 x4
Q418~Q421 2SC1815-GR x4
INHIBIT CONTROL
Q901 2SC2120-Y
Q902 2SD880-Y
Q903 2SD880-Y
Q904 2SA950-Y
Q905 2SC2120-GR
220V/240V 50Hz
D509, D510, D512 TLR208 x3
D501~D508, D511 TLG208 x9
S901 Standby Switch --- ON Position
Pee
O/S Data CK2 CK1 DOWN UP FM/AM ST/MONO
+5V(B.U) +5V GND RST
-35V F
2SK30A
2SA950 2SC1815 2SC1923 2SC2120
2SD880
TD6104P
NJM4558D
TA7654P TC4066BP
HA1197 HA12016 LA1231
TC9137P

Figure 31.

Symbol No.	Part No.	Description
R203, 204	22545183	18K ohm
R205	22545222	2.2K ohm
R206	22658495	100K ohm, Semi-fixed Variable
R207, 208	22545473	47K ohm
R209, 210	22545332	3.3K ohm
R211	22545473	47K ohm
R212	22545102	1K ohm
R213	22545562	5.6K ohm
R214	22658513	5K ohm, Semi-fixed Variable
R401	22545103	10K ohm
R402	22545103	10K ohm
R403	22545103	10K ohm
R404	22545102	1K ohm
R405	22545102	1K ohm
R406	22545472	4.7K ohm
R407	22545472	4.7K ohm
R408	22545472	4.7K ohm
R409	22545104	100K ohm
R410	22545103	10K ohm
R411	22545103	10K ohm
R412	22545104	100K ohm
R413	22545473	47K ohm
R414	22545472	4.7K ohm
R415	22545393	39K ohm
R416	22545472	4.7K ohm
R417	22545393	39K ohm
R418	22545272	2.7K ohm
R419	22545472	4.7K ohm
R420	22545103	10K ohm
R421	22545823	82K ohm
R422	22545333	33K ohm
R423	22545103	10K ohm
R424	22545473	47K ohm
R425	22545472	4.7K ohm
R426	22545472	4.7K ohm
R501	22545823	82K ohm
R502	22545124	120K ohm
R503	22545333	33K ohm
R504	22545393	39K ohm
R505	22545393	39K ohm
R506	22545103	10K ohm
R507	22545223	22K ohm
R508	22545823	82K ohm
R509	22545271	270 ohm
R510	22545273	27K ohm
R511	22545473	47K ohm
R512	22545271	270 ohm
R513	22545333	33K ohm
R514	22545103	10K ohm
R515	22545822	8.2K ohm
R516	22545221	220 ohm
R517	22545221	220 ohm
R518	22545221	220 ohm
R519	22545221	220 ohm
R520	22545221	220 ohm
R521	22545102	1K ohm
R522	22545222	2.2K ohm
R523	22545122	1.2K ohm
R524	22545222	2.2K ohm
R525	22545222	2.2K ohm
R601	22545223	22K ohm
R602	22545473	47K ohm
R603	22545103	10K ohm
R604	22545103	10K ohm
R605	22545103	10K ohm
R606	22545102	1K ohm
R607	22545392	3.9K ohm
R608	22545223	22K ohm
R609	22545474	470K ohm
R610	22545103	10K ohm
R611	22545473	47K ohm
R612	22545473	47K ohm
R613	22545103	10K ohm
R614	22545564	560K ohm
R615	22545474	470K ohm
R616	22545103	10K ohm
R617	22545154	150K ohm
R618	22545104	100K ohm
R619	22545104	100K ohm
R620	22545104	100K ohm
R621	22545104	100K ohm
R622	22545223	22K ohm
R623	22545223	22K ohm
R624	22545104	100K ohm
R625	22545104	100K ohm
R626	22545332	3.3K ohm
R627	22545332	3.3K ohm
R901	22547332	3.3K ohm, ½W
R902	22545102	1K ohm
R903	22547102	1K ohm, ½W
R904	22545471	470 ohm
R905	22545681	680 ohm
R906	22545331	330 ohm
R907	22547392	3.9K ohm, ½W
R908	22545471	470 ohm
R909	22545103	10K ohm
R910	22545102	1K ohm
R911	22545471	470 ohm
R912	22545102	1K ohm
R913	22545103	10K ohm
R914	22545471	470 ohm

Symbol No.	Part No.	Description
ACCESSORIES		
AC01	22164775	Conector Cord
AC02	22124701	Feeder Ass'y, Antenna (TU)
AC03	22903077	Owner's Manual (TE)
AC03	22903078	Owner's Manual (TU)
AC04	22906280	Manual Card

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